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AMERICAN POTASH INSTITUTE, INC.

INVESTMENT BUILDING **WASHINGTON, D. C.**

Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

Editorial Office: Investment Bldg., Washington, D. C.

VOLUME XXIII NUMBER TWO

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American Potash Institute, Inc.
Investment Building, Washington, D. C.

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It Looks Good Enough to Plant.

Better Crops with PLANT FOOD

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VOL. XXIII WASHINGTON, D. C., FEBRUARY 1939 No. 2

Better Farm Life Is Condensed at—

Farmers' Week

By Jeff McDermid

ALTHOUGH it's a decidedly unusual winter for us up north, with some folks engaged in plowing upland acres clear into December, I suspect lots of us will give the teams a few days' rest and take in the annual Farmers' Week in February. The plowing can wait until March —what there is left of it.

Plowing seldom interferes with our midwinter short course down at the State cow college campus—except for snow plowing. And most of that big job of removing drifts belongs to the hired highway crews with their huge motor-driven, fan-blade scoopers; and the slat wire snow fences hold back many of the drifts besides. So we haven't much excuse for not attending the college doings, save for the best excuses known to farmers everywhere—hungry live-stock, regular milking to be done at too little recompense, or maybe rheumatism or the measles.

But no matter how weak farmers may be, "Farmers' Week" is still a drawing card on the old home calendar. Almost as soon as Dad brings it home from the implement and hardware emporium, and we have admired the rainbow-tinted picture of the hunter's campfire which adorns it, and looked with some misgivings at the patent weather calculator on each leaf, it is time to mark certain positive dates thereon.

Next in importance to the farrowing and lambing days ahead, we must outline in pencil the dates for setting incubators or buying baby chicks. When

these are settled after family debates, we get our announcement from the extension folks to notice carefully and get set for good old "Farmers' Week." That calls for red ink drawn around six whole days, including "ground-hog" day.

When the ground is frozen up in our country, the human mind is thawed out and very soft. Hence "Farmers' Week" comes fortunately when we are in the best mental tilth to receive the kernels of wisdom and experience flowing from the seed-boxes of our noble professors. Only rarely do we meet a friend at these occasions whose mind is as dense as reinforced concrete, which no genial comradeship may thaw or puddle out.

Moreover, as observed aforesaid, ground-hog day is invariably included in our annual "Farmers' Week" cycle. I think there is more than casual coincidence therein. The ordinary ground-hog or woodchuck in our parts goes into lazy retirement and devotes the frigid season to domestic affairs entirely, which includes plenty of shut-eye as well as shut-in. He has lived with us farmers as neighbors so long he can't escape the community propensities.

BUT as the old sun swings back so it shines past the barn corner through the northwest kitchen window on its way home to the seeding season, Mr. Ground-hog and Mr. Farmer bestir themselves from languorous lethargy. Both of them stretch a little and sneak out to look over the meadows and get a dose of sunlight vitamins for their mangy hair and tangled whiskers. But if the sky is too dazzling and the shadows are too sharp along the fence rows, it means another bit o' burrowing. So the ground-hog and the rest of us grab what encouragement we can from our brief foray afield, and dodge back in again to think it all over until the wild geese shall summon us to the actual springtime.

That's why we are observing Farmers' Week at the ground-hog season. It's a good time to come up for exercise and ventilation. Some of us are afraid of seeing ominous shadows before and behind us too, but come to think of it, not a single farmer or a single ground-hog in my bailiwick fails to bob up later to earn a good breakfast when the rush starts.

EXTENSION leaders up our way had no little bother finding the best period of the winter solstice in which to entertain their friends of the furrow with open house and free lectures. Christmas and New Years are of course taboo. Then January brings along the tax bills to think over and cuss about—and farmers cannot be edified when highly aggravated. March is too fully occupied with sugaring-off, seed testing, and holding things down against the winds. And waiting until April would be as bad form as staying abed after five o'clock, a genuine insult to agricultural culture.

So we have adopted George Washington's and Abraham Lincoln's birthdays, St. Valentine's Day and Farmers' Week as regular feast dates for February observance—so that we give our patriotism, our romance, and our husbandry a frosty but hopeful overhauling. In a freer choice of seasons and lack of damaging inclemency, the extension folks down south have considerable advantage. I should enjoy taking in one of their programs, because I would not have to park my fur cap, mittens, muffler, ear-muffs, overcoat, leggins, and arctics. One would thus find educational processes less burdensome.

As an additional inducement to snowbound rural seekers after truth, our February farm programs at the State headquarters are held amid the oratorical clamor and political persiflage of the legislature. When some relaxation from the erudite academic events is demanded, the visitors can call a recess and eat lunches of crackers and cheese while seated in the gallery above the general assembly of elected statesmen. This juxtaposition of the planets of wisdom occurs once every two years, leaving the off-years to the professors unassisted.

I believe the professors get a slight edge on the deal, though, because budgetary problems often yield to the deft persuasion of delegations from the remote hills, who corner their solons on matters of rural welfare appropriations. Even a governor charged with a frenzy for retrenchment must yield to the pressure of farm demands by staunch constituents suffering from woeful neglect, outstanding inequality, and a few chilblains. Indeed I am highly in favor of holding these events together, but I am just as sure that many of the lawmakers get more agricultural education out of those ten hectic days than the farmers. In fact, that's part of our program.

Before we had the benefit of these February assemblies at the capital, back in the times of slow roads and boom towns, the legislature granted goodly sums of money to be used in taking the agrarian gospel out yonder and beyond. They called these meetings "institutes" in the papers, and gab-fests elsewhere. The word "institute" in our State was derived from short instruction courses for teachers, who wanted third grade certificates to get jobs in fourth rate settlements. The teachers' institutes wound up with examinations, but everybody knew better than to try that idea with the farmers.

WE HAD a State supervisor of farmers' institutes, who employed a methodical maiden lady clerk to help him fit the schedules among the county seats and lesser hamlets, and finally to publish a paper-bound yearbook, usually filled with the proceedings of the round-up institute. The round-up was a climax rodeo meeting at which all the circuit-riding local session speakers jumped in for a final powwow. A stenographer woke up after each of their talks and patted her pompadour in shape so as to get the flow of pros and cons handed out by the folks on the rear seats whose opinions and experiences were sure to follow. Here the old revival meeting system had full play, except that few speakers ever confessed or admitted anything.

The conductors who led these welterweight bouts were chosen for their ripe farm experience and physical endurance. It had to be thus, because the rooms were small and poorly ventilated, and lots of folks in the audience came in with dead chickens and spotted livers to be diagnosed or identified, which was no parlor kissing game for a weakling. If the conductor failed to guess whether it was toxemia or bots that was to blame, he held the package at arm's length and stated that science had a lot to learn yet and we must be generous with our taxes.

Hardly any of the college staff came to those backwater meetings in those days, because extension funds were small and the farmers wanted to control the institute finances so they might put in a word or two now and then for some favorite organization. Nobody ever toted in soil samples in the early institute days, because it would have been suicide to inform a chap that his land was sour and submarginal. Like-

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Apparent Changes in Southern Farming

By C. W. Summerour

Montgomery, Alabama

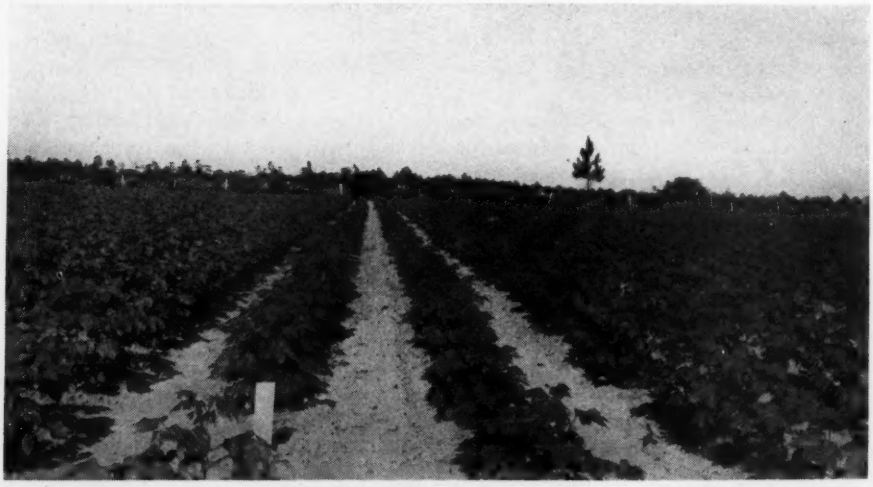
THE agricultural adjustment programs which have been in effect during the past six years, are causing significant changes in farm practice in the Southern States. The trend is now away from the long-established cash crops which for many years previously showed gradual increases, and the acreage is being diverted to producers of crops which will provide food for the population of the area and feed for growing numbers of livestock. At the same time, attention is being given toward restoring and maintaining the fertility of the soil.

A study of the statistics concerning the acreage devoted to the South's most important crops reveals that the area planted to cotton, tobacco, and peanuts is less than the average of the years 1928-32, inclusive, but other crops have shown an increase. The greatest decrease has been in cotton, while significant gains have been made by all feed crops.

Acreage changes in the leading crops during the past decade are shown in the following tabulation:

Crop	Average 1928–32, inclusive	1938*
Cotton	39,619,000	25,798,000
Corn	31,329,000	33,153,000
Tobacco	1,653,000	1,512,000
Peanuts	2,186,000	2,154,000
Small Grain	13,505,000	16,745,000
Hay Crops	9,093,000	12,569,000
Soy Beans	513,000	1,629,000
Cowpeas	904,000	3,037,000

*Based upon July 1 estimates of U. S. D. A.



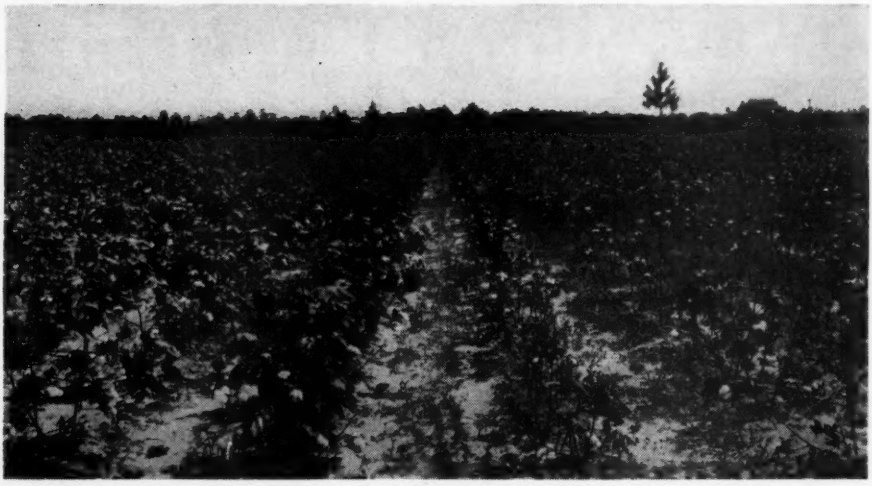
1. A promising crop, an excellent "stand," a vigorous growth—this entire field is off to a good start.

2. Still growing and now fruiting rapidly. No indications of plant-food deficiencies.

Official estimates of the acreage planted to winter legumes are not available, but it is recognized that tremendous expansion has been made in these crops, and the indications are that the 1938 seedings to vetch, winter peas, and crimson clover will be the greatest on record. Mississippi leads the South in winter cover-crop acreage, with Alabama in second place. Each reports more than 500,000 acres seeded in 1937, as compared with less than half this area only two years before.

Coincident with the change in cropping practice in the Southern States has come the realization of the necessity for revision of some of the long-established methods of fertilization. Whereas in past years practically all of the fertilizer used has been applied to cotton, the need for an application to other crops which are being grown in the rotation is becoming more and more apparent. Not only is it coming to be regarded as desirable that the soil-building crops be fertilized in order that the

3. Before reaching full size and while they should have been still fruiting, the plants without extra potash start maturing (right). Those with sufficient potash continue to grow (left).



4. After all the leaves have been shed, many immature bolls are left where insufficient potash was applied (right). The cotton that received ample potash continues to mature bolls properly (left).

most growth may be obtained from these crops, but experimental evidence indicates that the fertilization of crops which succeed the legumes will need to be changed, particularly if the latter are removed from the soil.

In the case of winter legumes which are turned under, it is being observed that certain deficiencies are appearing when they are followed by cotton. Since such crops add only nitrogen, the usual amounts of potash and phosphate are not sufficient to make a proper balance, and yields are not up to expectations. Several experiment stations are finding that substantial increases are being obtained from cotton following a winter legume when the potash application is raised above the amount commonly used.

The complete removal of a crop from the soil results in a heavy loss of plant food, and serious deficiencies may result in the crop which follows unless steps are taken to guard against it.

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5. Foreground; insufficient potash. Background: side-dressing with potash.

Sweepstakes Fruit Does Not "Happen"

By H. G. Bell

Ontario Agricultural College, Guelph, Ontario, Canada

ANNUAL national and periodic international fruit shows tell the world that several Ontario apple orchardists know how to grow a superior crop of this delectable fruit. This is not by chance. Sweepstakes-winning fruit does not "happen." It is the product of scientifically managed orcharding under favorable conditions.

About one and one-half miles back from Georgian Bay, and just outside the Town of Collingwood, is located an orchard that has brought fame to Ontario and to Canada. It is located on a gravelly loam soil which is well drained naturally and with tile. The proximity of the large body of water modifies the climate so that extremes of cold or heat are not frequent.

The subject of our sketch, W. L. Hamilton, chose this site on account of its soil and climate, and accessibility to markets. He started in 1912 with 12 acres of orchard, and now has a plant of 40 acres comprised of 500 young trees, and approximately 750 old trees. He grows Spies, McIntosh, Snows, and Greenings. The Spies come into best bearing about 18 years of age, and the McIntosh from 7 to 8 years. It takes 4 men permanently and approximately 35 men temporarily employed to handle Mr. Hamilton's crop.

But, before we discuss his methods, briefly, may we trace styles in orcharding for the past 25 years? About that long ago an exceedingly important piece of work was being done in the Washington County orcharding area of Ohio. This famous orchard country had gotten to the stage where trees blossomed abundantly in spring, but they set very few apples. Pruning was resorted to with some success. Spraying gave additional help, but real revival waited on the feeding of the orchards with balanced fertilizers. Ohio Station published an important bulletin on this work in which was shown an

W. L. Hamilton displays a box of his perfect stock.

illustration of 12 Ben Davis fertilized trees that yielded a total of 49 barrels of large marketable apples, while 12 adjoining trees, unfertilized, yielded only 20 barrels.

The next year the fertilized trees yielded 46 barrels, and the unfertilized 9 barrels. This work led to a revolution in orcharding methods. Then another piece of work was reported from Oregon Experiment Station. The results of this latter project indicated that nitrogen alone was the important element in set and development of fruit.

Then the switch in styles took place in many orchards, and nitrate of soda, sulphate of ammonia, or cyanamid were the only carriers of plant food added. Overemphasis of nitrogen brought its reward in many instances: Increase in number of apples, decrease in size, and delay in ripening with loss of color, along with a weakening of the constitution of the orchard trees.

This is where we revert to Mr. Hamilton and his methods. He says "Orcharding is like feeding a horse. If you have a good horse and feed him well, results will be satisfactory. Orcharding is much the same."

He attributes his success to four things:

1. Study of Soils.
2. Study of Varieties.
3. Careful Spraying.
4. Fertilizing.

About 1907-1908 Mr. Hamilton purchased wood ashes in car lots, applying a car of 20 to 30 tons of ashes to less than 30 acres of orchard.

At the present time he applies a coat of barnyard manure to his orchard soils in the spring of every other year. His fertilizing practice is to purchase 1 ton nitrate of soda, 1½ tons super-phosphate, and 2 tons muriate of potash. These he mixes together and applies uniformly on top of the soil to 30 acres of orchard. He disks this plant food in as soon as the soil will work in spring. The last week in May he sows buckwheat, allowing it to grow to maturity and stand until the following spring. The buckwheat prevents evaporation and helps maintain the organic matter of the soil.

Mr. Hamilton prunes moderately every winter and early spring. In spraying he follows the spray calendar closely. His present spraying equipment consists

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Home of the Apple King of Canada, William L. Hamilton, at Collingwood, Ontario.

Quick Tests Show Southern Soil Needs

By Frank Moser

South Carolina Agricultural Experiment Station, Clemson, South Carolina

THE recent marked interest in soil fertility problems has stimulated the development of rapid test methods for determining fertilizer requirements of soil. Numerous attempts have been made in the past to correlate soil productivity with chemical analysis of soils. Since complete chemical analyses of soils did not give any information concerning the availability of nutrients in the soil, research work has been done to develop simple chemical methods which would determine the availability of some of the nutrients.

As a result of this research several methods of testing the soil for available nutrients have been introduced, such as the Truog, Bray, Morgan, Emerson, Spurway, and Thornton methods. Equipment for these tests can now be obtained from certain experiment stations or commercial supply companies. These rapid chemical test methods are coming into general use by such agencies as the State experiment stations, extension specialists, and fertilizer companies.

The results of the quick test methods have proven beneficial to trained agronomists in making fertilizer recommendations. There is particular need for information on the availability of nutrients in the soil in the older agricultural sections of the South where the bulk of fertilizer is used. It is particularly important that the farmers have information on the amount and kind of fertilizers to apply on the various soils for different crops.

A number of the experiment stations are attempting to provide facilities for testing soil samples and making fertilizer recommendations to farmers. The South Carolina Experiment Station in 1937 tested 1,838 soil samples for acidity and fertilizer requirements. During 1938 more than 4,500 samples were tested and the results reported to farmers. Since these quick test methods have been developed at the various experiment stations under widely different conditions, it was felt that it would be desirable to make a comparative study of these methods on some of the Piedmont and Coastal Plain soils of the cotton belt.

The soil samples used in this study were taken from the cooperative fertilizer experimental fields where continuous fertilizer tests with cotton have been carried on for a number of years. These samples were collected during April and May, 1937. The samples were brought to the laboratory and tested for available phosphorus and potash by the various rapid test methods. Analyses were also made for available phosphorus by the Truog-Myer method and for replaceable potassium.

Comparison of Methods

Calibration of the different tests is necessary for the various agricultural regions. The conditions where most of the rapid test methods were developed are very different from the conditions in the southeastern area. For the comparative study of methods, equipment was purchased from the manufacturer or made in the laboratory according to published specifications. The methods differed mainly in the

type of extracting solution, the concentration, the pH value, the buffer capacity, the procedure of making tests, and the method of expressing results. All of the phosphorus tests are based on the Deniges color reaction. The potassium tests are a modification of the sodium-cobalti-nitrite method. The standardization of each method for determining the available phosphorus and potassium was individually calibrated by checking the color chart of each test against prepared stock solutions containing known parts per million of either phosphorus or potassium. These results were then converted to pounds per acre.

Results of Phosphorus Tests

The results of the studies for available phosphorus on Cecil sandy clay loam and on Orangeburg fine sandy loam are included in table 1. The data indicate that these methods are satisfactory for diagnosing the phosphorus requirements of these soils. The Purdue and Bray methods tend to give consistently higher readings than the other methods, which may be attributed to the use of the relatively strong acid extracting solutions by these two tests, as the higher amounts of phosphorus were obtained especially on those soils where accumulated residues of phosphorus had occurred from heavy annual fertilization. This was more pronounced on the Orangeburg fine sandy loam than on the Cecil. In general, the amounts of available phosphorus as shown by the rapid test methods are in accordance with the fertilizer treatments. There also appears to be a correlation between the amounts of available phosphorus as determined by these methods and the Truog-Myer method.

The plats which received varying amounts of phosphorus, ranging from 0 to 160 pounds phosphoric acid per acre on the Orangeburg fine sandy loam, showed an availability of phosphorus in accordance with the rate of application by both the Truog-Myer method and the rapid test methods. The rapid test methods gave a very low amount of available phosphorus in the Cecil sandy clay loam, which would indicate that these soils would respond to relatively heavy applications of phosphorus. There was little difference in the available phosphorus between the plats which received a high and a low amount of this element. This is probably due to the fact that the light application of phosphorus was not sufficient to allow any accumulation of available phosphorus in the soil.

The increased amount of phosphorus removed by larger yields and the fixing power of the soil probably largely accounts for the lack of accumulation of available phosphorus. In general, the results from the rapid test methods on Cecil sandy clay loam are indicative of the phosphorus requirements of the soil. This is verified by the yield data which show that there was an increase in yield corresponding with the increase of phosphorus in the fertilizer. The yield from the plat receiving no phosphoric acid was 545 pounds of seed cotton; whereas 1,027 and 1,142 pounds were obtained from the plats receiving 48 pounds and 72 pounds of phosphoric acid, respectively.

The yield data on both the Orangeburg and the Cecil series showed a very good response to phosphorus fertilization. However, the correlation between the available phosphorus from the rapid test methods and the Truog-Myer method on the Orangeburg fine sandy loam is not as good as on the Cecil sandy clay loam. This may be due to the high fixing power of the Cecil series for phosphorus.

Results of Potash Tests

The rapid test methods show an abundance of available phosphorus in the Orangeburg soil receiving 160 pounds of phosphoric acid, which indicates that such a high rate of fertilizer is not required for this soil. The yield data are in agreement with this conclusion, as in 1937 only 2,047 pounds of seed cotton per acre were produced on the 160-lb. plat; whereas the plats which received 40 pounds and 80 pounds

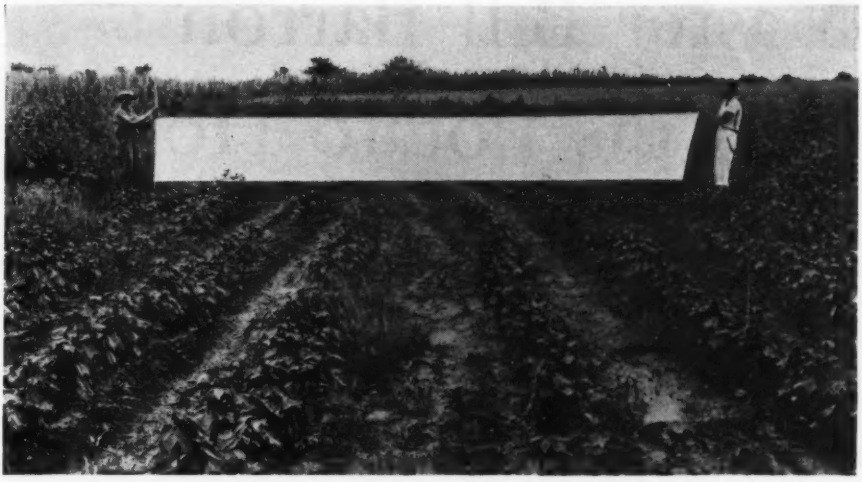

Fig. 1.—The effect of phosphorus on cotton yields on Cecil sandy loam. The above plat which received no phosphorus produced only 313 pounds per acre; whereas the lower plat which received 60 pounds of phosphoric acid per acre produced 897 pounds of seed cotton.

yielded 1,950 and 2,329 pounds, respectively. Thus, the phosphorus tests show differences in available phosphorus, and may be satisfactory for indicating fertilizer needs of certain soils.

Other studies on availability of soil phosphorus, as illustrated in Figure 1, exemplify the beneficial effects of phosphorus fertilizer on Cecil sandy loam. The rapid tests made on these two plats also showed a low supply of available phosphorus, indicating that phosphorus must be added for maximum yields. The results of this fertilizer experiment show that the plat receiving no phosphorus produced only 313 pounds of seed cotton, whereas the plat receiving 60 pounds of phosphoric acid produced 897 pounds per acre, an increase of 584 pounds for approximately 300 pounds of superphosphate.

All the rapid test methods for determining the potash requirements of soils

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Master Bill Barron Wins Potato Honors

By Henry Wylie

Escanaba, Michigan

IT IS NEWS when a high school boy grows 400 bushels of potatoes to the acre. It is better news when this same Smith-Hughes boy beats his dad and all the other commercial growers in Delta County, Michigan, with a yield of 478 bushels per acre. But when the Nov. 19 issue of the *Michigan Farmer* tells us that this yield of 478 bushels puts him in second place among all of the growers in the Upper Peninsula this year and only 13 bushels behind the highest yield of 491 bushels reported at the Upper Peninsula Potato Show, held in Escanaba last month, that is real news.

William Barron had the highest yield of potatoes in Delta County and the second highest in the Upper Peninsula of Michigan this year.

William Barron, Escanaba High School student, did that this year, and his record of 478 bushels per acre with which he won the first Smith-Hughes Premier Potato Growers' Contest held in the Upper Peninsula will give other high school boys in Michigan a fine record to shoot at next year.

Here is "Bill's" story of his record crop. "Our farm is located in Flat Rock, 8 miles northwest of Escanaba, on a fertile silt loam. My potatoes were following a crop of rutabagas, so I disked twice last fall. We put on barnyard manure during the winter at the rate of 15 loads to the acre. The field was plowed deep this spring, disked twice, and harrowed to put it in good shape for planting.

"I purchased my Certified Russet Rural Seed from my father and treated it with corrosive sublimate before planting. We planted June 7, and the planter, which was set to drop the seed 10 inches apart in 32-inch rows, put on 30 bushels of seed to the acre. Our planter is equipped with a fertilizer attachment and we put on 1,000 pounds of a 3-12-12 commercial fertilizer to the acre at the same time we were planting the potatoes.

"I dragged the field twice before the potatoes came up, cultivated once when the plants were 4 inches high and again when they were up about 8 inches. We do not hill our potatoes. Our sprayer operates at 350 pounds pressure, and I sprayed the crop six times with Bordeaux during the summer. The pota-

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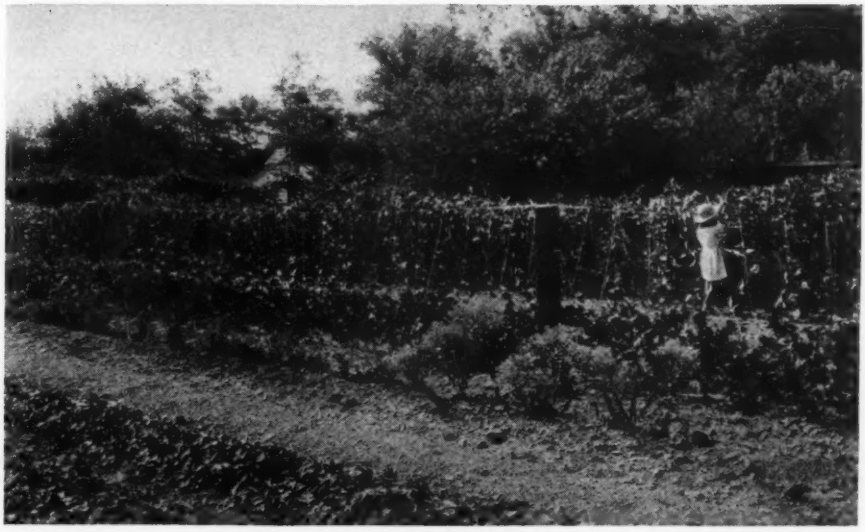

A dollar saved is a dollar made. Records show that $400 worth of family food products may easily be grown on the farm. This well-kept garden is on the farm of J. A. Milner, Weakley County, Tennessee.

Farm Records Show What Practices Pay

By J. A. Elliott

University of Tennessee, Agricultural Extension Service, Knoxville, Tennessee

THE MAN doing the job is still the best source of information on how it should be done. With this in mind, the University of Tennessee Agricultural Extension Service set out several years ago to discover the "hits and errors" in farming through a cooperative farm-account project. The farmers agreed to keep the records; the Service, through its Farm Management Department, agreed to make scientific and detailed studies in an attempt to determine what the ills of farming were and what paid best.

Now with more than 15,000 records of actual farm operation collected over a 12-year period, these Farm Management men are able to say with a good deal of justification what the agriculture of this section needs. And due to its diversity of climate, typography, and resultant types of farming, the variety of farming conditions found in Tennessee represent about everything found in the Southeast. A study of the records indicate that farmers generally need to:

(1) PROVIDE HOME-GROWN FOODS FOR THE FAMILY. The smaller the farm business, the more important the food production program becomes. Frequently on farms where

Small farms having less land need to sell more labor. This means intensive crop and livestock enterprises, such as tobacco, cotton, truck and fruit crops, dairying, and poultry. Clyde McDonald, Rhea County, Tennessee, is making the most of his land by planting strawberries in a young peach orchard.

subsistence is carefully planned, the value of food produced amounts to as much as the products sold. Farm and home records show that farm food products consumed in the home often amount to $400 or more in value each year. Where these items are overlooked it is necessary for the farm to produce 7 or 8 additional bales of cotton, 600-700 bushels of wheat, 1,500-2,000 pounds of Burley tobacco, or 20-25 top hogs to buy them.

(2) HAVE THREE OR MORE DEPENDABLE SOURCES OF INCOME. Several sources of income encourage crop rotation for fertility maintenance and erosion control; spread the labor load; lesson the danger from crop failure or low prices; and keep ready cash coming in at different times during the year, thereby cutting down the need for credit, with the necessary interest payments, found on most one-crop farms. The main sources of income should be selected so as to yield the largest net income from all resources. They should not compete for land or labor but should supplement each other.

(3) INCREASE CROP YIELDS. Records clearly indicate that crop yields should be from 25 to 50 per cent higher than the present average for efficient production. Low crop yields are usually associated with high production costs. Data obtained during recent years show that it costs 69 cents per bushel to produce corn where yields are less than 20 bushels per acre, and only 32 cents where they are 40 bushels or more. Similar studies on cotton show a cost of 12 cents per pound where yields are less than 150 pounds lint per acre, contrasted with 6½ cents where they are 500 pounds or more. Burley tobacco was produced for 8½ cents per pound where yields were 1,250 pounds or more, but cost 12 cents where they were less than 750 pounds.

(4) INCREASE LIVESTOCK PRODUCTION PER UNIT. Farm flock cost records during the 5-year period 1930 to 1935 showed the income per hen above expenses to be $2.33 where production exceeded 200 eggs annually and only $1.05 for the group of hens producing less than this number. Tests by dairy herd improvement associations in Tennessee last year revealed that feed costs per 100 pounds of milk averaged $1.05 on 563 cows

making over 5,500 pounds, but ran up to $1.54 on 651 cows making a yearly production of less than 4,000 pounds.

(5) BALANCE CROP AND LIVESTOCK PRODUCTION. On most farms there are waste products from crop production that may well be fed to livestock. Likewise most farms have land that is best adapted to pasture under a soil conservation program. Adequate crop rotation almost always provides hay and pasture for livestock feed. Livestock, requiring most attention during the slack winter season when work with crops is not pressing, help to spread the labor load and keep farm hands profitably employed. Then, too, experiments show that grains and roughages may be marketed through livestock, and, with careful preservation of manures, from 60 to 80 per cent of the essential plant food elements returned to the soil. The most successful general farms almost always received as much as 40 per cent of their income from animal sources.

(6) USE MORE OF THE INTENSIVE ENTERPRISES, PARTICULARLY ON THE SMALLER FARMS. After all, farmers are selling three things: The use of land, labor, and capital. As farms become smaller with increasing rural population, there will be less land per family from which to sell products. It may be difficult to increase the amount of available capital but oftentimes it's possible to intensify the farm business with no additional money or land. It would be difficult to make a decent living for a farm family on 75 acres with only wheat, beef cattle, and sheep, regardless of how efficiently these might be produced. These enterprises require relatively large amounts of land and would not keep the family employed at profitable labor. Invariably, the smaller farms making the best incomes combine some of the intensive enterprises such as tobacco, cotton, dairying, poultry, truck crops, or fruit with the more extensive beef cattle, sheep, small grain, and hay crops. Even with the intensive enterprises, farms are usually too small for efficient operation if they do not have as much as 30 acres of cropland. This, of course, is not true of farms with some specialty product.

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Farm management studies in Tennessee show that the most successful farmers balance crop production with livestock. Good crops, good livestock, and good pasture stand out on the farm of W. T. Moffitt and Son, Warren County, Tennessee.

Yankee Soil Round-up

By J. W. Spaven

University of New Hampshire, Agricultural Extension Service, Durham, New Hampshire

YANKEES this year completed the biggest round-up ever made in New Hampshire. These men helped find, rope, corral, and deliver 3,000 samples of their best stock. A New Hampshire round-up is far different from those yearly made on the cattle ranches of the west. Our men are not cowhands in the true sense of the word. The biggest percentage of them were dairymen, yes, but others were vegetable gardeners, tobacco growers from the fertile Connecticut River Valley, and many were just good, all-around farmers. Nor were their samples of stock cattle, but cans, big and small, of soil—stock in which they have invested their lives and their earnings. These farmers sent their cans of soil to the agricultural chemistry laboratory at the State University to find out just what it needed, so that with the proper plant food they could reap bigger crops, and thus have their "soil-stock" pay bigger dividends.

Each of New Hampshire's 10 county agricultural extension agents played a big part in the 1938 round-up. The agent set a definite day for his county round-up. Circular letters announcing the date and the method for the farmers to follow in taking a good soil sample were sent out from the county office. The farmers collected samples of the fields to be tilled this year. These they brought to the village store, or left them at the milk station when they brought their milk. Some deposited coffee cans of soil with their feed and fertilizer dealer. The county agent gathered hundreds of samples from such places, and when they were all corralled in his office, he put them in his car and brought them to the soil laboratory at Durham.

Some of the 3,000 various containers in which soil samples were sent to the State University to be tested. County agents recommend pint ice-cream boxes for soil samples and often supply their farmers with them at round-up time.

Round-ups in New Hampshire are no new thing. For the past 5 years county agents have found a soil-sample round-up day the best method of getting the sample from the field to the laboratory. A definite round-up date has best served to remind New Hampshire farmers to send their samples for testing. Round-ups have also solved the problem in getting the cans of earth to the laboratory without any expense to the farmer.

The county agents and the soil analysts also find that a concen-

trated drive for soil samples is best for themselves. The county agent is relatively free from samples straggling into the office all through the year. A round-up also brings in more samples than any other practical method the county agent could employ.

During 1938 round-ups were emphasized more than ever before in the programs of the New Hampshire Extension Service agents. One reason for this was the Agricultural Conservation Program, which, more than any other movement in 300 years of agriculture in New England, has encouraged farmers to make greater strides in maintaining the fertility of their soil. The encouragement received through the Conservation Program will carry on for years, if the attitude of New Hampshire farmers, who witnessed the growth of their crops scientifically fed with the correct plant foods, is any indication.

Round-ups make it possible for samples to be tested for all the common plant foods by an experienced soil chemist. Formerly the test was made right on the farm by the bromthymol blue method, as shown above, and determined only the pH of the soil.

Encouraging Results

As a result of the program in New Hampshire last year, farmers applied nearly 12,000 tons of limestone to 16,000 acres; over 400 tons of muriate of potash to 10,000 acres; and 5,000 tons of superphosphate to 27,000 acres. And as a result of county round-ups and the resulting rapid soil tests, farmers probably will receive more benefit from these plant foods than any other fertilizer ever applied to their farms.

Soil testing for New Hampshire farmers today is a far cry from that day when soil testing was first initiated, some 12 years ago. At that time chemists limited their test to lime requirements alone. Today each sample of earth that is sent to the laboratory is carefully examined for ammonia and nitrate, nitrogen, phosphorus, aluminum, magnesium, potassium, calcium, and pH. This detailed testing started October 6, 1933, when Louis French, a Center Barnstead farmer, brought in the first sample examined by the new method. In the first year that the new testing method went into operation, about 400 New Hampshire people mailed or brought samples to the laboratory. This year nearly 10 times that number have been tested.

But it is not always samples of croplands that find their way into the soil-testing laboratory. One ambitious farmer, wishing to grow mushrooms in the cellar of his New Hampshire home, sent in samples of peat and soil to see if this mixture would give the mushrooms enough plant food. Earth from lawns, golf courses, yes, and even cemeteries has found its way into the test tube of the agricultural chemists.

Containers used by farmers in last year's round-ups varied greatly, with coffee cans the first choice, and paper ice-cream containers running a close second. Cans from an inch in height to those of the 5-gallon type were sent to

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Fertilized Ponds Produce More Fish

By Donald L. Robertson

Editor, Agricultural Extension Service, Alabama Polytechnic Institute, Auburn, Alabama

TO 99 out of every 100 persons, fertilizer is synonymous with plant growth and better cotton or corn or some other crop. Yet the time may not be far distant when fertilizer manufacturers will add a new, recommended use for their product—the growing of fish. And before long landowners, farmers, and the city business man may be speaking of his per-acre production of fish as compared to pounds of seed cotton or corn per acre.

Tests conducted in Alabama during the past 4 years have shown that as much as 580 pounds of fish per acre of pond can be produced annually by proper fertilization. This much fish would mean more meat, aside from the sport of catching them, than the average beef cattle or hog producer can grow on the same amount of land. That is, if one could technically or untechnically consider fish as meat.

However, as with cotton, corn, and other crops, these tests have proven that fish ponds also need a balanced fertilizer for maximum results.

Comparatively little has been said about this new use of fertilizer, and yet the principle is simple. The fertilizers feed small plants, some microscopic, which in turn furnish food for the fish. These plants float through the water, and if present in sufficient amounts, give the water a light green or brown color. In addition, these plants are eaten directly by several species of fish and also furnish food for insects, tadpoles, crawfish, and other small animals upon which the fish feed.

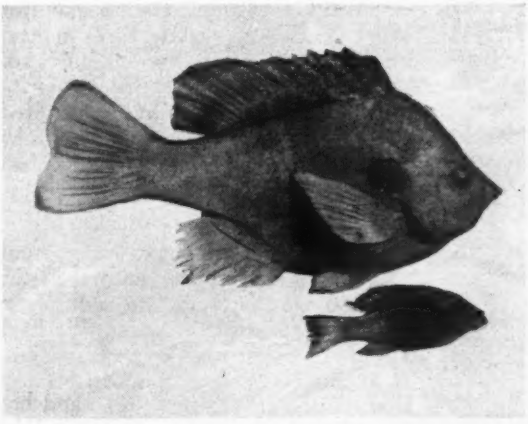
The abundance of these plants can be increased by the use of balanced fertilization, and the increase in plants will in turn increase the pounds of fish produced per acre.

There are hundreds of ponds over the South which, while devoted to fish raising, are sadly lacking in fertility. Ranging from "mud puddles" to lakes, these ponds offer water for fish to swim in, but little if any food. For many years Director M. J. Funchess of the Alabama Experiment Station had wondered why fish could not be grown successfully in these ponds. For the past 4 years H. S. Swingle, fish culturist of the station, has been finding out that fish could be grown in any farm pond by adding fertilizer to the water.

Fertilization was only one of the phases of fish culture on which Mr. Swingle worked. But in the study he found that plants furnish most of the food and that fertilization furnishes food to these plants. Unfertilized ponds have produced from 100 to 200 pounds of fish per acre, and properly fertilized ones have produced as high as 580 pounds per acre. In an experiment, which was repeated more than once, two ponds of identical size, design, and structure were stocked. Pond No. 1 was stocked at the rate of 180 pounds of fish per acre, and pond No. 2 was stocked at the rate of 2 pounds, 5 ounces per acre. The following results are typical: At the end of 1 year, pond No. 1 produced 92 pounds of fish, and pond No. 2 produced 105 pounds. Analyses of the water showed that an al-

most identical food supply was available in each pond. This experiment indicates that heavy stocking is useless, and that the amount of fish which can be produced per acre is mainly dependent upon food supply. Therefore, if the pond is available, probably the most important consideration is how the fish can be fed for good growth. If it is desired to produce more pounds of fish per acre of water, fertilizer should be used.

Potash furnished part of the plant food in the mixture of fertilizers which Swingle found to be most profitable. Ammonia, 16 per cent superphosphate, and basic slag or ground limestone were other fertilizers found best in the pondplants' diet. The most profitable mixture he has found for each application per acre of water is 5 pounds muriate of potash, 40 pounds sulphate of ammonia, 60 pounds superphosphate, 30 pounds basic slag or 15 pounds ground limestone.



Showing the difference in size of Bluegill Bream due to food supply. Both of these fish are 18 months old. The one above grew in a fertilized pond. The one below was in an unfertilized pond.

The same results were obtained when the fertilizers were applied separately and when mixed just before they were applied. Basic slag cannot be mixed with the other materials and stored for any length of time, as it causes loss of ammonia. Approximately the same results were obtained by using 100 pounds of a commercial mixture of 6-8-4 plus 10 pounds of nitrate of soda per acre at each application.

Best results were secured when the first application of fertilizer was applied in the spring as soon as the danger of floods was past (usually April or May). When the pond had not been previously fertilized, two to three applications were made at weekly intervals. After this, applications were made whenever the water became clear (approximately every 4 to 6 weeks), with the last application in September. The ponds thus received 8 to 10 applications per year. The cost per acre varied from $10 to $14.

Various methods of applying the fertilizer were studied, and it was found that methods depended upon the size of the ponds. The method that seemed to be best for small ponds was for the fertilizer to be applied by walking along in the edge of the water and broadcasting it towards the deeper water. No attempt was made to completely cover the pond, as the wave action gradually spread the fertilizer over the entire pond. At the same time, care was taken not to apply any of the fertilizer right at the edge of the water, as this would encourage the growth of weeds.

In large ponds the fertilizer was broadcast from boats over the area where the water was from 1 to 5 feet deep.

Fertilization is one of several factors that must be kept in mind in planning the home fish pond. There is, for instance, the matter of construction, stocking, protection of the fish from animals, and the caring for the pond. Each of these is important if one is to attain success in fish production.

However, gathering the data on proper fertilization is perhaps the first in importance. Swingle's results so far

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Potash Is Nature's Plant Vitamine

By Lee VanDerlinden

Ottawa, Ohio

FOR many years the writer has been chiefly interested in phosphates, and practically all of his experimental research has been conducted with that one element. No one will deny that phosphate is of first importance in agriculture. But it is a fact that nitrogen and potash must be used on most of our soils in conjunction with phosphate, if proper results are to be secured.

Without doubt, there are some areas in this country where one element can be used successfully, but in our great Midwest the need is largely for a balanced mixed fertilizer. In fact, in several Ohio counties our experimental work in 1938 indicates the need of a fertilizer which may appear unbalanced, in that so large an amount of potash can and does produce such excellent results. In April 1938 J. W. Ossege of Ottawa, operating a small canning plant, asked for a fertilizer to use on tomatoes on a 45-acre piece of soil of the Jackwax type. We carefully analyzed this field and found it to be as follows: pH, 6.5; active calcium, 1,000 lbs.; available P_2O_5, 10 lbs.; available K_2O, 125 lbs.; active magnesium, 150 lbs.; and per cent nitrogen, .185.

The history of this 45-acre field was such that we urged Mr. Ossege not to plant tomatoes, but to sow it to sweet clover. It had not been manured for 20 years, and corn followed corn for 10 years, with wheat as a nurse crop for clover twice in 20 years, and a poor clover catch—no crop worth harvesting.

However, Mr. Ossege insisted upon using the field for tomatoes, so we recommended a 2-20-20 fertilizer and used the following formula:

350 lbs. milorganite per ton
100 lbs. sulfate of ammonia
894 lbs. treble superphosphate
656 lbs. 61% potash

This mixture gave us 2,000 pounds. It was broadcast at the rate of 500 pounds per acre, disked, and dragged well into the soil. We frankly felt the grower could not secure enough fruit from this worn-out soil, which was almost devoid of available plant foods, to pay for labor, fertilizer, plants, and general farm overhead. However, in July Mr. Ossege was boasting of his wonderful tomato field. An inspection showed just fair-looking plants, but they were very prolific of blossoms and small fruit.

More Than He Could Use

To digress a moment, Mr. Ossege has a very small plant, located in the rear of his hatchery, on our main street. It has a small capacity, perhaps of 600 tons. He does considerable custom canning, and he cannot turn regular customers away. For the past several years he has grown about 45 acres for his own canning use and has always planned on between 7 and 10 tons per acre, seldom achieving more than 6 or 7 tons. Hence, his plans were disturbed in 1938, because he harvested 14 tons per acre from this 45 acres of worn-out land. He was unable to use the fruit in his own plant and had to sell almost 7 tons per acre to another canner.

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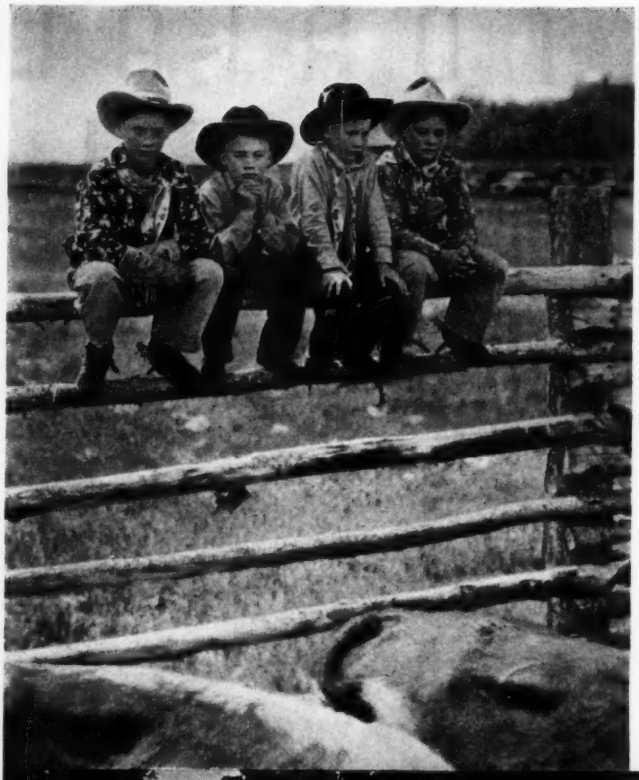
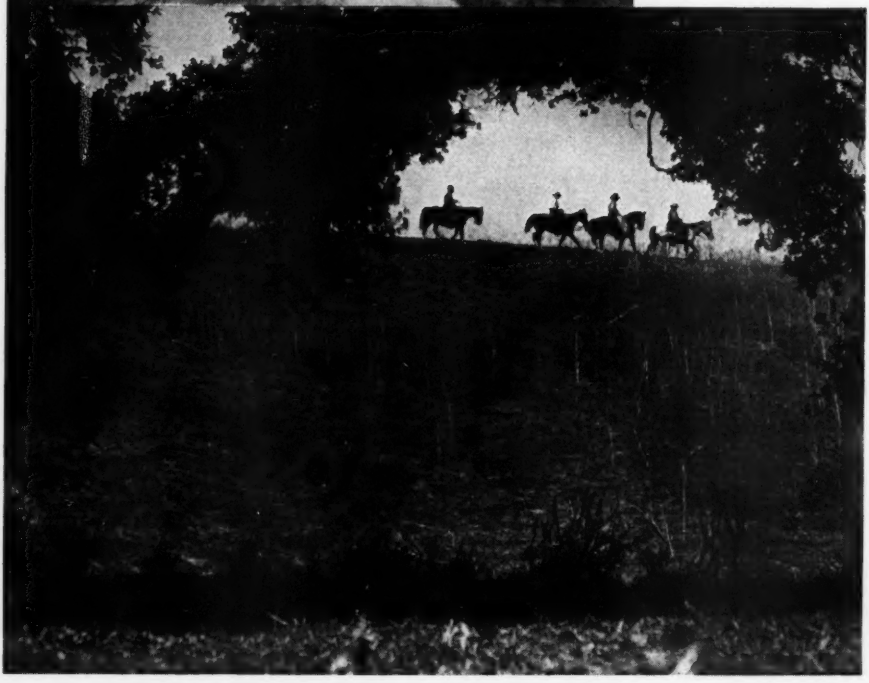
PICTORIAL

In spring, the "Moods of the Elements" range from balm to fury.



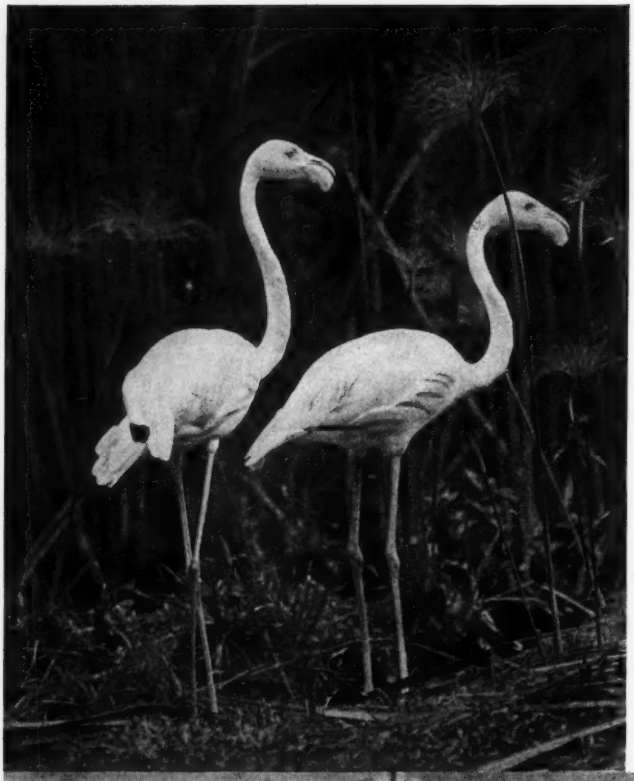
Left: No "dress-up cowboys" are these four sons of Western ranch hands.

Below: When the trail breaks onto the horizon, interesting scenes appear.



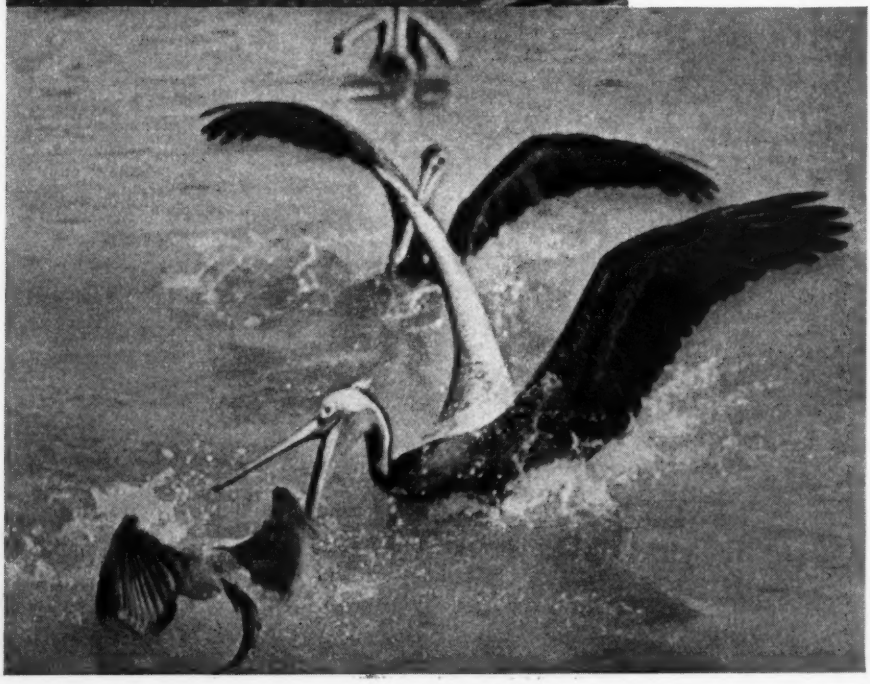
Above: Many an old swimming hole draws the gang in winter.

Right: Spring thaws lend added difficulties to right-of-way legalities.



Left: The poise of white flamingoes blends well in tropical landscapes.

Below: It isn't always the big fellow who gets the coveted prize.



The Editors Talk

The Southern Agricultural Workers Meet

In our democratic approach to better agricultural conditions, any solution of the problems involved, if it is to be feasible and practical, must come primarily from within the groups in the region affected; from the people and the leaders themselves rather than a solution chiefly imposed from without. The South has set a very excellent example of getting together to discuss its agricultural problems and suggest methods for the betterment of farm life in the South. Some 1,200 agricultural workers representing the Southern agricultural colleges and experiment stations, departments of agriculture, and many other National and State agencies met on February 1 to 3 at New Orleans for the 40th Annual Convention of the Association of Southern Agricultural Workers.

This convention is different from many other meetings in two respects. First, its purpose is to study the problems of a definite region, and second, it brings together workers from all branches of agriculture. Extension research in all its phases, agricultural economics, Federal Government agencies, home economics, agricultural administration, and many other types of activity are all represented. The convention reaches out to everybody interested; it generates within itself a realistic and human interest and a balance in viewpoint that may be too often lacking in gatherings of the more nationalized and specialized fields of activity.

The convention theme, "Problems in Plant, Animal, and Human Nutrition as Related to the Social and Economic Life of the South," well represents this more inclusive viewpoint. In its broadest aspects different phases of the theme were presented on the opening day by well-known speakers at a joint meeting of several of the sections. The theme was also ably discussed by the President of the Association, Dr. H. P. Cooper, Dean and Director, Clemson Agricultural College, South Carolina, in his annual presidential address. The three-day convention was divided into several sections dealing with different types of subject matter; also into joint meetings with the Southern sections of many societies, as with the American Society of Agricultural Engineers, the American Society of Horticultural Science, the American Phytopathological Society, and the Southern Agricultural Editors. The U. S. Department of Agriculture and the Farm Security Administration were also represented by well-known workers in these fields.

The importance of fertile soils and the maintenance of soil fertility as a fundamental in a balanced farm program was fully recognized. The Soil Conservation Service, U. S. D. A., presented an excellent program which started off with a paper by H. H. Bennett, Chief of the Service, on "Avenues to Proper Land Use." Other subjects included, "The Soil Conservation District" and "The Importance of Soil Conservation in Dairy Programs." The Agronomy Section held a "Symposium on Soil Fertility." Important discussions centered around fertilizer prob-

lems, the use of the so-called secondary elements, and especially a discussion on the value of rapid soil-testing methods for determining fertilizer requirements of soils in which speakers from several States participated. The major opinion was that such methods were of value if used by competent workers. One or two speakers, however, still prefer to depend on the results of field tests and other methods as a basis of making fertilizer recommendations. The use of fertilizer also received a prominent place in other sections in the soil and crops division.

As the substitution of other crops for abandoned cotton acreage increases, new economic problems arise, hence the prominence given agricultural economics, marketing, and Farm Security Administration activities. The rehabilitation of a farm family, improved health of low income farmers by balanced diet, and a long list of other topics were discussed by the Farm Security Administration. It is significant that "Marketing" was the general theme of the Southern Commissioners of Agriculture. Marketing in its various phases was included on the programs of several other groups. Vocational agriculture, animal husbandry, dairy, horticulture, forestry, and poultry all presented problems involving farm practice. The tenor of the Convention was a balanced agricultural production with emphasis on more efficient marketing and better living conditions.

An event of outstanding importance was the presentation by the Hon. Frank Lever, Farm Credit Administration, Columbia, S. C., in behalf of the Association, of very fine tokens of appreciation to several prominent workers. We are glad to repeat their names here. All are recognized for many years of faithful service in Southern agriculture. They are: Dr. W. R. Dodson, Baton Rouge, La.; Dr. J. F. Duggar, Auburn, Ala.; Dr. J. A. Evans, Athens, Ga.; Dr. B. W. Kilgore, Raleigh, N. C., and Dr. J. R. Fain, Athens, Ga. Tokens for two distinguished workers who recently passed away, Dr. Tait Butler, Memphis, Tenn., and Dr. David R. Coker, Hartsville, S. C., were presented to their families. On behalf of the recipients of these tokens, Dr. Kilgore replied in a delightfully reminiscent vein. Dr. Kilgore was an active worker in the Association when it organized its activities and has continued with undiminished interest since that time.

As different sections of the country seek solutions to their problems and a better balanced agricultural program, it is meetings like this that must point the way to effective change. The officers and executive committee of the Association of Southern Agricultural Workers have set a very excellent example to follow. Such an effective plan of getting together might well be adopted in other parts of the country.

H. J. Baker

It is with deep regret that while recounting the very commendable activities of the Southern Agricultural Workers, we must record the distinct loss to Northern and National Agricultural Extension Workers in the passing of Herbert J. Baker on January 6. Mr. Baker, who for more than 25 years had been in extension work and for nearly 16 years was Director of Extension in the State of New Jersey, died on January 6 of a heart attack during a dinner in connection with the annual conference of the Service.

The influence of Mr. Baker's sincere service was international in scope. In 1919 he was granted leave of absence to go to France, where he set up a farm school as part of the A. E. F. University. In 1928 the U. S. Department of Agriculture commissioned him to make a nation-wide survey of extension work, which aroused wide interest. Always active and creative in his leadership, space does not allow detailing his many other activities. Such leadership and service as Mr. Baker's are unforgettable contributions to agricultural progress.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

¶ Complying with the current demand for knowledge regarding commercial fertilizer usage under Idaho farm conditions, H. W. E. Larson in Extension Bulletin 109, entitled "Fertilizer Suggestions for Idaho Farmers," gives a thorough and very informative discussion of the numerous factors associated with soil fertility problems. The principal causes for decreased soil fertility in many areas of the State during the past 15 to 20 years are due to the prevailing crop system, non-utilization of field wastes and farm manures, and exhaustion of the available supply of plant food in the soil.

With the exception of localities where moisture is the limiting factor, the value of farm manure has long been recognized. Phosphate fertilizers have been found profitable on a majority of the soils in the Snake River plain area. Nitrogenous fertilizers are profitable where insufficient farm manures and green manure crops are available. The publication explains that new stands of forage legumes in cut-over areas in the northern part of the State are facilitated by small applications of nitrogenous fertilizers. Certain truck crops prove profitable where potash fertilizers are used. Their use on forage legumes, such as alfalfa, has proved advantageous in some cases in the southwestern area. Complete fertilizers having a high content of potash give response when used on the peat and muck soils.

Besides giving specific fertilizer recommendations for various crops which are readily determined from the comprehensive chart contained in the bulletin, the author describes the functions of the primary and secondary elements and the various nutritional deficiency symptoms of each, methods of applying commercial fertilizers, home mixing, and residual effect. An interesting discussion on soil and field testing for plant-food requirements is also included. It is emphasized that the use of commercial fertilizers should always be considered as supplemental to the practice of a good rotation, the incorporation of adequate amounts of organic matter in the form of farm manure, crop residues, and green manures, and the maintenance of good tilth.

¶ Numerous additional publications on fertilizer recommendations for a diversity of crops in the various agricultural regions of the country are among the recently issued bulletins. Officials responsible for these suggestions base their interpretations on painstaking research as well as the many factors entering into the economic scheme of production. The time is past when farmers can by any stretch of their imagination choose a fertilizer on a trial and error scale and achieve good results. We believe, therefore, that the information given in the following list of publications will serve a most useful purpose in promoting intelligent fertilizer usage.

"Fertilizer and Lime for Vegetables," Agr. Ext. Serv., Storrs, Conn., Bul. 265, June 1938, M. F. Morgan and Albert E. Wilkinson.

"Fertilizer Recommendations," Agr. Ext. Serv., Newark, Del., Inform. Card No. 40, Jan. 1939.

"Relation of Magnesium Deficiency in Grape-

fruit Leaves to Yield and Chemical Composition of Fruit," Agr. Exp. Sta., Gainesville, Fla., Tech. Bul. 331, Jan. 1939, B. R. Fudge.

"Recommendations with Reference to the Fertilization of Flue-cured Tobacco Grown on Average Georgia Soils for the Year 1939," Agr. Ext. Serv., Athens, Ga., Oct. 24, 1938.

"Fertilizer Recommendations for Field Crops in Indiana," Agr. Exp. Sta., Lafayette, Ind.

"Fertilizer Suggestions for Field Crops in Iowa," Agr. Ext. Serv., Ames, Iowa.

"Fertilizers for Field Crops in Louisiana," Agr. Ext. Serv., University, La., Ext. Cir. 167 (Revised), Oct. 1938, R. A. Wasson, M. B. Sturgis, and W. G. Taggart.

"The Effect of Various Nitrogenous Fertilizers on Soil Factors Affecting the Yield of Crops," Agr. Exp. Sta., University, La., La. Bul. 301, Oct. 1938, Franklin L. Davis.

"Fertilizer Recommendations for Muck Soils 1939-40," Agr. Ext. Serv., East Lansing, Mich., 1-39:2.5M.

"Fertilizer Rates and Analysis Test-Cotton-Cooperative Tests with Junior Colleges," Agr. Exp. Sta., State College, Miss., Inform. Sh. 161, Dec. 1938.

"Cotton Fertilization," Agr. Exp. Sta., State College, Miss., Inform. Sh. 162, Dec. 1938.

"Cotton Fertilization," Agr. Exp. Sta., State College, Miss., Inform. Sh. 163, Dec. 1938.

"Fertilizers for Field Crops in New Jersey," Agr. Ext. Serv., New Brunswick, N. J., Dec. 1938, H. R. Cox.

"1939 General Fertilizer Recommendations for Vegetable Crops," Agr. Ext. Serv., New Brunswick, N. J.

"Recommended Fertilizers for New York," Cornell Univ. Agr. Ext. Serv., Agron. Leaf. 9, Jan. 1939.

"Grades of Fertilizer Adopted and to Be Sold in North Carolina During 1939," Dept. of Agr., Raleigh, N. C., Jan. 1939.

"Celery Stem Crack and the Use of Boron in Its Control," Agr. Exp. Sta., Corvallis, Oreg., Sta. Cir. of Inform. 194, Jan. 1939, A. G. B. Bouquet and W. L. Powers.

"Use of Boron in Controlling Canker of Table Beets," Agr. Exp. Sta., Corvallis, Oreg., Sta. Cir. of Inform. 195, Jan. 1939, W. L. Powers and A. G. B. Bouquet.

"Fertilizers Recommended for the State of Pennsylvania," Agr. Exp. Sta., State College, Pa., Dec. 1938.

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Soils

¶ Virginia Agricultural Experiment Station Bulletin 317, entitled "Fertilizer and Manure Experiments on Dunmore Silt Loam Soil," by M. S. Kipps and T. B. Hutcheson, contains information of particular value to farmers of southwest Virginia. The experiment was inaugurated in 1909 to determine the effect of varying fertilizer and manure practices on a standard 4-year rotation of corn, wheat, red clover hay, and timothy and red top hay. In 1914 the plan of the experiment was adjusted somewhat on account of the irregularity in yield of check plots. Because of this, the results of the experiment prior to 1914 are not included in the data presented. Each crop in the rotation is considered separately for the three 8-year periods, and a summary for the entire period of 24 years is given.

Considering the rotation as a whole, the data show that phosphates and potash should be used for economic increases in yield of the crops studied. Nitrogen is also of considerable importance for wheat and grass hay. It is concluded from these data, therefore, that a fertilizer carrying both phosphoric acid and potash should be applied on soils of this type for the crops in the rotation. The authors suggest that nitrogen may be omitted from the fertilizer treatment for corn and wheat at seeding time. Whenever the grass hay or wheat crop shows delayed growth in the spring, top-dressing with nitrogen is advised. In case of clover failure in any year, nitrogen probably should be included as a part of the fertilizer for both corn and wheat.

An interesting observation on the pulling resistance of corn stalks as measured by an apparatus designed for this purpose was made during the years from 1927 to 1932, inclusive. It was determined that corn receiving phosphoric acid and nitrogen but no potash gave a resistance of 131 pounds. Where potash was added to the above treatment, the resistance was 215 pounds. The pulling resistance is an indication of the strength of the roots. It is evident that corn which received potash produced plants with stronger roots than where potash was omitted, and the plants with weak roots were less resistant to storm damage. In good seasons, the potash-deficient stalks stood erect, but in periods of heavy

rainfall, particularly when followed by winds, they fell down badly.

Results from other investigations on experiments with continuous cropping, sources of phosphorus, and the effect of farmyard manure with and without phosphoric acid, are also given in the bulletin.

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"Thirty Years of Soil Fertility Investigations in South Dakota," Agr. Exp. Sta., Brookings, S. Dak., Bul. 325, June 1938, Joseph Gladden Hutton.

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Crops

¶ Ohio's 4,000 farms now growing sugar beets represent a minor fraction of the potential area, according to E. P. Reed, J. A. Slipher, A. L. Pierstorff, and T. H. Parks in Ohio Agricultural Extension Bulletin 194 entitled, "Growing Sugar Beets." Within the climatic range suitable to beet production are thousands of farms, part or all of which have soils naturally adapted to the crop. It is claimed also that the current yield of 8.8 tons per acre could feasibly be increased to 12 to 20 tons, as has been demonstrated by growers themselves. Strict adherence to the basic fundamentals of soil and crop management, set down and easily interpreted in this interesting publication, should definitely mean a great deal to beet producers in way of attaining better yields. Since half of the acre-cost of growing the beet crop is fixed, raising the yield 50% reduces the ton-cost a fourth.

A brief discussion of soil types naturally adapted to beet growing is given. Having satisfied the natural requisites with regard to the soils ideally suited, two measures are indispensable. They are: "tilth without tillage," meaning soil crumbs built by grass and legume sods to afford proper porosity; and "fatten with organic matter," the product of which is mellowness, aeration, and water capacity of a good rootbed. Long rotations that include grass and clover, with a span of 4 or 5 years between beet crops to escape carry-over of beet disease are strongly advocated. Addition of manure furnishes active organic matter as well as valuable plant food.

Fertilizer under the beet plant makes for health and fast growing. A 10-ton yield of beets takes up three-fifths as much nitrogen, two-thirds as much phosphorus and three times as much potash as a 40-bushel corn crop. Added potash under certain conditions lessens the susceptibility of the beet root to disease and, on deficient soils, measurably enriches sugar content. Soils low in phosphorus are likely to cause the seedlings to suffer from blackroot. Yield response and economic returns support the use of 300 to 400 pounds of fertilizer carrying liberal amounts of phosphoric acid and potash, with a modest percentage of nitrogen for most situations. A standard fertilizing schedule for dark mineral soils, muck, sand, and other soils not adequately manured is listed in chart form. These include such analyses as 4-10-6, 2-12-6, 0-14-6, 2-8-10, and 0-12-12. The fertilizer acts best when it is placed in two bands ½ to 1½ inches on each

side of the row and 1 to 2 inches below the seed level.

Other cultural measures, such as plowing and preparing the seedbed, best seeding methods, blocking and thinning, a guide to the parade of cultivations, and harvesting the crops are thoroughly explained. Descriptions of the sugar beet diseases and insects with control of the corresponding attacks are also given in the bulletin.

¶ Wisconsin sugar beet growers especially will be interested in a well-prepared summary of the "Report on Sugar Beet Fertilizer Demonstrations in Wisconsin—1938", given in a recent mimeographed release by C. J. Chapman and O. S. Aamodt, of the University of Wisconsin. This is the second year cooperative demonstrations were conducted with a number of growers in collaboration with several sugar and refining companies, local county agents, and the college officials. It is urgently advised that all sugar beet growers test their soils before either purchasing fertilizer or planting the crop. By doing this it will be possible to determine with greater accuracy the kind of fertilizer that is needed. If the soils are acid, the fields should be limed at rates indicated by the test for acidity.

To get high yields of sugar beets, the authors state that the soils must be abundantly supplied with the essential plant-food elements. The value of manure and leguminous crops in maintaining the level of fertility and incorporation of organic matter is recognized.

The results of the demonstrations given in this report, likewise the experience of Wisconsin growers, indicate that commercial fertilizers may be used to advantage, even where considerable stable manure is used on legume sod. Where all the commercial fertilizer is applied at the time of drilling the seed, mixtures carrying some nitrogen should be used. The authorities recommend such mixtures as the 3-12-12, 3-18-9, or 2-12-6. Soils which show a low content of potash and phosphate by test should receive a broadcast application of 0-20-20 at rates up to 300 or 400 pounds per acre. Where the potash level is very low and the soil contains a fairly good supply of phosphate, as is frequently the case on the low black bottom soils of the Fond du Lac region, a broadcast treatment of 0-9-27 and a row application of 3-9-18 is recommended.

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Economics

¶ Perhaps one of the most practical and interesting functions of the various Agricultural Economics and Farm Management Departments in our colleges and experiment stations is the keeping and summarization of farm cost accounts. More or less typical of the farm cost-account studies is a recent publication of Cornell University Bulletin 395, "Cost and Returns from Farm Enterprises from 82 Cost-Account Farms, 1937," by Paul S. Williamson. Although records of this type have been kept by Cornell University since about 1914, this particular bulletin is a summary of one year's results, 1937. The summary

is particularly interesting because 1937 is usually thought of as one of the more profitable recent years from an agricultural viewpoint.

The wide use of cost-account data is somewhat limited because of the fact that it is generally recognized that farms of the operators who cooperate in cost-account work are usually better than average, larger than average, and perhaps better managed. Thus the average of the 82 farms included in the study is probably considerably better than for the average of the State as a whole. This point is noted at the outset in the bulletin. The average labor income on the cost-account farms since 1914 has been about $688 per year. That is, the amount that the operator receives for his work and management. This is comparable to what a hired man would receive who lived on a farm in a house provided by his employer and furnished with milk, wood, and other farm products for the household. Since 1914 the operator's labor income on the cost account farms of New York has varied from about $2,114 received in 1936 to $1,695 less than nothing in 1931. In 1937 the operator's average labor and management wage was $365 as compared to $688 for the entire period and $2,114 in 1936. It is particularly interesting to note that the average was $1,376 from 1914 to '19, $273 from 1920 to '24, and $1,094 from 1925 to 1929, a minus $392 from 1930 to 1934, and $1,126 from 1935 to 1937. In other words, the average in the last period has been greater than any other period since 1914, with the exception of the war period of 1914 to 1919.

The relative profitableness of any particular enterprise, it is noted in the bulletin, should not necessarily determine its place in the organization of the farm. For instance, feeding of beef cattle in the winter may not pay its fair share of the total amount of expense, but it may add to the total net income of the farm, and since there is no other enterprise at that time of the year which probably would be more profitable, the feeding enterprise is justified simply on the grounds that it utilizes the available equipment at a time when it otherwise would be idle. In 1937 the dairy enterprise was not particularly profitable on the 82 cost-account farms in New York. The total cost for each cow was $193.52, the total return, $183.73, an average loss of $9.79, which of course includes allowances for the operator's labor and all items of cost.

In the cash crop list, cabbage seemed to be exceptionally profitable in 1937, averaging a profit of $50.98 per acre, as compared to a loss on potatoes of $13.90, and a profit of $39.43 on canning tomatoes, a profit of $16.56 on canning peas, and a profit of $1.27 per acre on dry beans, a loss on apples of $26.27, and a profit of $0.28 on peaches, a profit of $8.66 on pears, and a profit of $186.50 on cherries. A few farms produced sweet corn for canning and market and the average return was about $4.11 per ton.

For the cash crops, fertilizers represented an important part of the total cost of growing. On potatoes about 662 pounds of fertilizers were used, costing about $13.07 per acre as compared to a seed cost of $22.48 and labor cost of about $9.22. In the cabbage enterprise, the average fertilizer application was 525 pounds per acre at a cost of about $8.54. The labor cost was $13.21 and the seed was $4.13. The fertilizer application on tomatoes averages 854 pounds per acre at a cost of about $11.16. This compares to the cost of plants, $15.82, and labor cost of $10.92. On canning peas 246 pounds of fertilizers were used on the average, which cost about $2.32 per acre as compared to seed costs of $16.00 and labor costs of about $2.16. The fertilizer application on sweet corn was about 233 pounds per acre and cost $3.51 as compared to seed which cost $2.22 and labor costs of $4.70. An average of only 124 pounds of fertilizer costing about $1.87 per acre was used on dry beans which compared to seed costs of $5.56 and labor costs of $3.95.

An important measure of the relative profitableness of the various enterprises is the rate per hour of labor.

In 1937 canning factory peas led the list with a return of 99¢ per hour of labor expended, compared to 92¢ on cabbage, and 58¢ on sweet corn. Cherries were also relatively profitable in 1937, producing about 85¢ per hour of labor as compared to 16¢ on apples and 32¢ on peaches. In the livestock list, the incubation of chicks seemed to be the most profitable, producing $1.78 per hour, as compared to 23¢ for dairy cows, 17¢ for hens, and 18¢ for raising chicks, a loss of 32¢ on sheep, loss of $1.01 on feeder lambs, and a profit of 20¢ on hogs.

¶ According to the recent report, "Indiana Fertilizer Tonnage Sold in Indiana in 1938 as Reported by Fertilizer Manufacturers," there was a 2.6% decrease in fertilizer sales in that State as compared to 1937. The decrease in tag sales was about 14%. The 2-12-6 analysis continued to be the most popular, representing about 47% of the total sales. The popularity of the 1-6-3 ratio is shown by the fact that it accounted for about 52% of the total consumption. The next most popular ratio was 0-1-1 which accounted for about 12% of the total. The most important analysis in this group is 0-12-12. The old 2-12-2 grade which was once very popular has fallen to an insignificant t o n n a g e representing about 3% of the total.

¶ Fertilizer sales in Vermont amounted to 20,067 tons in 1938 or 23% less than in 1937, according to Vermont Bulletin 440, "Commercial Fertilizers," by L. S. Walker, E. F. Boyce, and L. E. Davis. In 1938 about 66% of the fertilizers sold in Vermont contained 20 or more units of plant food. This compares to 63% in 1937, 57% in 1936, and 48% in 1929.

Another interesting observation is the fact that the average plant-food content of Vermont fertilizers has increased from 14½ units to 23½ units during the past 30 years. The average analysis has shifted from 2-8-4½ to 5-10-8½. The cost per unit of plant food has decreased as a result of the decreases in materials prices and the increased plant-food content.

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"1939 Agricultural Conservation Program—North Central Region, Restoration Land and Wind-erosion Area, Provisions Applicable Only in the Wind-erosion Area," U. S. D. A., AAA, Washington, D. C., NCR-301-RL, Dec. 15, 1938.

"1939 Range Conservation Program Bulletin, Applicable only to Texas and Oklahoma," U. S. D. A., AAA, Washington D. C., SRB-351, Dec. 8, 1938.

"Outline of the 1939 Agricultural Conservation Program in Massachusetts," U. S. D. A., AAA, Washington, D. C., NER-310, Jan. 1939.

"Procedure for the Determination of Fire-cured and Dark Air-cured Tobacco Farm Marketing Quotas for 1938, Part 1-General," U. S. D. A., AAA, Washington, D. C., Form 38-Tobacco-38, Nov. 5, 1938.

"Income Parity for Agriculture, Part 1.—Farm Income, Section 1.—Income from Cotton and Cottonseed, Calendar Years 1910-37, U. S. D. A., AAA, Washington, D. C., April 1938.

Foreign and International Agriculture

To supply information on agricultural research in other countries, titles and a few descriptive remarks of principal articles in the two magazines "Die Ernährung der Pflanze," published in Berlin, Germany, and "La Potasse," published in Mulhouse, France, are given here. Due to space limitation, only articles of general fundamental interest are given, although both magazines contain other articles of local interest and abstracts of outstanding articles in other publications.

Die Ernährung der Pflanze, January 1939, Vol. 35, No. 1

AGRICULTURE IN GREAT BRITAIN. *By G. A. Cowie,* London, England.

A brief description of agriculture in Great Britain, including acreages of principal crops, numbers and breed of animals, fertilizer usage, distribution of types of agriculture and their relationship to rainfall, government measures in aid of agriculture and agricultural education. From the viewpoint of acreage, clover and grasses, oats, wheat, barley, turnips and swedes, potatoes, sugar beets, fruits, vegetables, and mangels are the most important crops in the order named. The average ratio of total fertilizer consumption in Great Britain is approximately 1.0:1.7:1.5, referring to nitrogen, phosphoric acid, and potash respectively. It is stated that on the average, potatoes are fertilized with 45 lbs. of nitrogen, 40 lbs. of phosphoric acid, and 100 lbs. of potash per acre. Sugar beets receive 60 lbs. of nitrogen, 35 lbs. of phosphoric acid, and 120 lbs. of potash, while cereals are given 25 lbs. of nitrogen, 50 lbs. of phosphoric acid, and 20 lbs. of potash. The fertilization of fruit has received considerable attention in recent years, and on the basis of recent investigations the fruits are classified under two categories, according to their nutrient requirements: (1) those very responsive to potash applications, such as apples, red currants, gooseberries, raspberries and strawberries and (2) those which after potash is applied also respond freely to nitrogen, such as plums, black currants, cherries, and pears.

EFFECT OF MANURE ON THE SIZE OF POTATO TUBERS. *By B. N. Singh* and *M. L. Mehta,* Benares, India.

This article deals with the effects of different fertilization on the yield and size of potatoes in India. Under the conditions of this experiment, nitrogen was most important in its effect on yield and size of tubers. Potash was most effective in increasing the top growth and was not so influential on tuber developments in this experiment which is contrary to results in most places. Highest yields were obtained by the use of complete fertilizer. Larger tubers usually were associated with higher yields.

THE IMPORTANCE OF THE IBERIAN PENINSULA FOR GERMAN PLANT BREEDING. *By Dr. M. Klinkowski,* Berlin, Germany.

The author discusses the origin and natural habitat of the three plants, blue lupine, yellow lupine, and serradella. These natives of the Spanish peninsula have become very important in Germany and other countries, but it is pointed out that very little work has been done by plant breeders to segregate and improve the strains of these plants. He feels there are great possibilities for future work along this line.

FIRST INTERNATIONAL FERTILIZER CONGRESS, ROME, October 1938.

Reports of the Chairman of the various sections and recommendations for future work and meetings are summarized. It is noted that meetings are to be held every 3 years in Rome.

THE GROWTH OF CITRUS IN RELATION TO POTASSIUM. *By A. R. C. Haas,* Riverside, Cal.

This is an abstract of an article originally appearing in the California Citrograph, 1936.

THE INFLUENCE OF ONE PLANT ON ANOTHER, ALLELOPATHY. *By H. Molisch,* Wien, Germany.

This is a review of a book of the above name and author in which interesting and remarkable cases of the influence of one plant on another are described. Considerable attention is given to gases given off by plants, and it has been found that these gases influence to a considerable extent the growth of nearby plants. The effects are sometimes beneficial, sometimes deleterious. Both root and aerial parts of the plant give off these gases. A section of the book is devoted to substances influencing germination of seed. The work presented in this book, representing literature compilation and investigation by the author, appears to have an important bearing on the growing of plants, the aspects of which have received very little attention up to the present.

La Potasse, December 1938, Vol. 12, No. 116

THE FERTILIZATION OF GRAPES AND THE REJUVENATION OF THE ROOT SYSTEM.

This is a summary of work reported by E. Vinet. It was shown that when the fertilizer was placed down in the soil in a furrow about a foot deep and about 30 inches from the plants, good results were produced the first year, whereas in the past applications worked into the surface of the soil did not prove effective so quickly. Particularly noticeable was the recovery during the first year when potash was applied on a plot which in the past had received only nitrogen and phosphoric acid and showed potash deficiency.

"CHEVRIER" BEANS IN LOIRET. *By C. Parisot,* France.

The "Chevrier" bean has become quite important in central France, especially in the region around Orléans. This variety belongs to the kidney bean family and was accidentally found by a farmer named "Chevrier," hence the name. The bean is light green in color, uniform, and glossy. Directions are given for cultural practices which have proven satisfactory in this region. Manure, and phosphate and potash fertilizers are used. Nitrogen usually is given only if the beans are growing under less favorable conditions.

GRENOBLE WALNUTS.

Grenoble Walnuts are limited to certain varieties grown in a designated region in France, according to this short article. In order to produce high quality fruit the trees need to be sprayed and well fertilized. Manure is used in considerable amounts, but it has been found profitable to balance this with complete fertilizer comparatively high in phosphate and potash. The fertilizer not only increases the yield but has been found to improve the health of the tree and greatly reduce the effects of disease attacks.

VITAMINS IN ANIMAL NUTRITION. *By X. de la Poype.*

The author traces the development of our knowledge on vitamins and classifies them into the main and subgroups. The importance of vitamins and foods high and low in them are briefly discussed.

Fertilized Fish Ponds

(*From page* 21)

indicate that a great deal of progress is being made, and he is continuing and expanding the experiments. Fish ponds may not become as common as the home garden or the family plow mule, but with sport and fish available for the pond owner and friends at $10 to $15 per acre, there is every indication that there may be an increase among urban landowners and farmers. Further experimental work may reduce the annual fertilizer bill for the fish producer. Then, too, there is still the commercial angle which might open a new income route for the farmer.

Fertilizer Freight Costs

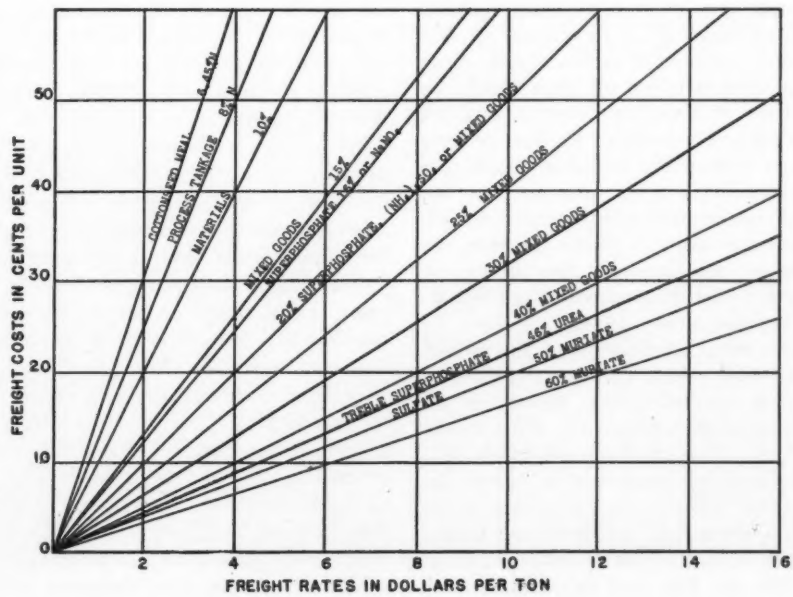
WHAT does it cost to distribute fertilizers? This is a question that concerns the farmer and his adviser alike.

Ross and Mehring ("Plant Food Concentration as a Factor in the Retail Prices of Fertilizers," American Chemical Society Annual Meeting, Fertilizer Division, Cleveland, September 1934) have shown that in North Carolina, the State with the greatest fertilizer consumption and some 85 mixing plants, the average cost of freight is $2.50 per ton, to which is added a trucking charge of 75¢, a total of $3.25 per ton. In larger States with fewer mixing plants, the charge is greater.

Accepting this figure as a working average for the country as a whole, the American farmer paid $17,875,000 delivery charges on the 5,500,000 tons of mixed goods that he purchased in the fertilizer season of 1937-38, in addition to which he paid the freight charges on additional large tonnages of phosphates, nitrates, and other materials. While paying freight on gross weight, what the farmer is buying is plant food. It is of interest to him, therefore, to know how he can secure delivery of plant food at the lowest cost per unit.

In the accompanying chart, the variation in freight cost per unit of plant food is shown for both materials and mixed goods. The cost per unit for a given freight rate is determined in the following manner. Assuming a $4 rate on a 15% grade of mixed goods, locate that rate per ton on the bottom line and move vertically upward to the point of intersection of this line with the line marked "mixed goods, 15%," then move horizontally across to the left-hand line and read cents per unit, namely 27¢ per unit of plant food. Now compare this figure with that

SHORT HAUL FREIGHT COSTS PER UNIT PLANT FOOD ON FERTILIZERS AND MATERIALS OF VARIOUS CONCENTRATIONS



derived in the same way for the 30% mixed goods, namely 13¢ per unit.

Likewise, compare the per unit cost of freight at $4 per ton for the high analysis with that of the lower analysis materials. Nitrogen: 46% urea, 9¢ per unit; 20% ammonium sulfate, 20¢; 8% tankage, 50¢ per unit nitrogen. Phosphorus: 46% triple superphosphate, 9¢; 20% superphosphate, 20¢ per unit P_2O_5. Potassium: 60% muriate, 7¢; 30% muriate, 13¢ per unit K_2O. In the case of both materials and mixed fertilizers, the higher the analysis, the lower the freight cost per unit of plant food. High analysis mixtures made up of high analysis materials thus represent a lower cost for freight, both into and out of the mixing plant.

This chart illustrates the familiar slogan—"Double the plant food and halve the freight."

Yankee Soil Round-up

(*From page* 19)

the State University with their load of earth. Naturally the inch container was much too small and the large one too big. County agents in all counties recommended, and in some cases furnished, pint, paper ice-cream containers for their farmers to use at round-up time.

New Hampshire flower lovers make up a good percentage of the soil laboratory's clientele. Each year hundreds of these men and women send in samples of their gardens before putting in new seed or bulbs. Since the rapid soil test started in 1933, the number of samples tested each year has doubled that of the preceding 12-month period—a concrete indication of the importance of science in the agriculture of our Yankee farmers.

Apparent Changes in Southern Farming

(*From page* 8)

For example, peanuts may be regarded as a soil-building crop if grazed off, but if the entire plant is harvested, more plant food is taken off than would be returned in 3 years of normal fertilizer applications to cotton. Peanuts remove a large part of the available potash and where only average amounts are applied, cotton following peanuts invariably yields poorly. Many farmers, not knowing the cause of the deficiency, have adopted the practice of not following peanuts with cotton.

The effect of increasing the potash application where cotton succeeds peanuts in the rotation is shown in the accompanying series of illustrations.

These photographs were made of a demonstration conducted in South Alabama in 1938. In the area shown, the entire cotton crop was fertilized with a 3-8-5 fertilizer mixture at the rate of 300 lbs. per acre and side-dressed with 100 lbs. per acre of a nitrogen material. A portion of the cotton field received a side-dressing of 200 lbs. per acre of muriate of potash. It will be observed that the application of 300 lbs. of 3-8-5 per acre was insufficient to feed the plant to maturity. An increase of 290 lbs. of seed cotton per acre was obtained from the additional application of 200 lbs. of muriate of potash per acre.

Where potash deficiencies similar to those shown in the accompanying illustrations are apparent, it is important that cotton receive a liberal application of a fertilizer mixture high in potash at planting time. If low percentages of potash are used on areas where rust is causing loss in yield and damage to quality of fiber, several State experiment stations in the South recommend that a supplemental application of potash be made soon after chopping at the

rate of 50 to 100 pounds of muriate per acre. If additional nitrogen is to be used, the extra potash may be applied in the form of a nitrogen-potash top-dresser.

It is the usual practice in the South not to apply fertilizer to corn, and to this custom doubtless in a large measure may be attributed the low average yields of this crop. That fertilizer will pay on corn was well demonstrated in a series of tests in Morgan county, Alabama, in 1937 and 1938 where a complete mixture more than doubled the yield over where no fertilizer was used and returned substantial profits over either nitrogen, phosphorus, or potash alone or a combination of any two elements.

As some indication of the large amounts of plant food contained in the so-called soil-building crops, the following data for some of the most important legumes and cover crops are given below.

The data include only the plant food in the top (with the exception of peanuts). The nitrogen may be considered as coming from the air, but the phosphoric acid and potash all come from the soil.

While the winter cover crops are usually returned to the soil, a large part of the cowpeas, soy beans, lespedeza, and other crops which are commonly grown as feed for livestock, are harvested and it may be seen from the above table that they remove large

Crop	Yield per Acre	Nitrogen	Phosphoric Acid	Potash
Cowpeas	3 tons	117.0	31.2	88.2
Soy Beans	3 "	160.0	40.0	110.0
Lespedeza	2 "	76.0	40.2	80.4
Alfalfa	4 "	188.0	43.2	178.4
Red Clover	2 "	83.6	17.2	83.2
Peanuts	1,500 lb. nuts 6,000 lb. top	68.1	12.3	46.8
Rye	15,000 lb. green	67.5	30.0	97.5
Hay	2 tons	60.0	16.0	54.0
Pasture	2 "	50.0	22.0	40.0
Velvet Beans	2 "	104.8	22.0	106.0

6. The corn on the left received a complete fertilizer and yielded 31.2 bu. per acre. The corn on the right was unfertilized and yielded only 7.9 bu. per acre.

quantities of plant food—far more than is applied to them in most instances. A sound farm management policy should call for the replacement of these elements, not only from the standpoint of immediate profit from the soil, but to maintain it for the benefit of future generations.

Quick Tests Show Southern Soil Needs

(*From page* 13)

are similar as they are modifications of the sodium-cobalti-nitrite method, and are of approximately equal value for determining the available potash in soils. A comparator similar to the one used in the LaMotte test was calibrated in parts per million for designating the amount of available potash. For convenience of expression, the results are converted to the conventional pounds per acre. Since the replaceable potassium in the soil has been accepted as an available form for plants, the replaceable potassium was determined for each of the soils used as a means of comparing the efficiency of the rapid test methods of determining the potash requirements of the soil.

The data on available potassium by the different methods are included in table 2. The data on the Cecil sandy clay loam showed consistent amounts of available potassium, which would suggest that this soil would not show a marked response to heavy potash fertilization. There was some increase

TABLE 1

Comparison of the Different Methods of Determining Available Phosphorus

Phosphoric acid applied, lbs. per acre	Yield of Seed Cotton per acre, 1937	Pounds of available Phosphorus per acre					
		Truog-Myer	Universal	Purdue	Simplex	Bray	La Motte
Cecil Sandy Clay Loam Soil							
0	545	70	1	1	1	1	1
12	753	80	1	1	1	2	1
36	893	100	1	4	1	4	1
48	1,027	120	1	4	1	8	1
72	1,142	130	2	4	1	6	2
Orangeburg Fine Sandy Loam Soil							
0	1,494	40	1	4	1	6	1
20	1,702	32	2	10	1	10	2
40	1,950	70	8	20	10	12	6
80	2,329	160	10	40	12	20	12
160	2,047	180	20	40	20	40	10

Nitrogen and potash constant.

in yield corresponding with the increase of potash in the fertilizer. An increase of approximately 100 pounds of seed cotton per acre was secured for each increment of potash included in the fertilizer mixture. All the tests showed a low availability of potash in the Orangeburg fine sandy loam. The plats receiving larger amounts of potash showed slightly more available potash in the soil.

The differences in the replaceable potassium are in agreement with the amounts added in the fertilizer. There is a larger amount of replaceable potassium in the Cecil sandy loam than in the Orangeburg fine sandy loam. There is also a close correlation between the yields and the amount of potash added in the fertilizer.

The results on other samples of Cecil sandy loam show that the available potassium by the quick test methods and by the replaceable potassium method was low. There was very little difference in the amount of available potassium from the plats receiving the various amounts of potash fertilizer; however, there was considerable difference found in the replaceable potassium from the plats receiving no potash and four per cent potash. The yield increased with each additional increment of potash, which indicated that the maximum amount of potassium fertilizer had not been applied to this soil.

A comparison of the various quick test methods for determining available potassium was made on a highly fertilized productive Bladen fine sandy loam. These soil samples had received no potash or 50-100 pounds per acre, with nitrogen and phosphoric acid constant in all cases. The rapid test methods show that there were about 80 pounds of potash per acre on the plats not receiving any potash, whereas on the plats receiving 50 pounds of potash the amount was 140 pounds, or practically double the amount found on no potash plat. The replaceable potassium on these plats was 94 and 172 pounds respectively. The rapid test methods for determining available potassium appeared to be suitable for soils containing

TABLE 2

Comparison of Different Methods of Determining Available Potassium

Potash applied, lbs. per acre	Yield of Seed Cotton in pounds per acre, 1937	Pounds of Potassium per acre					
		Replaceable	Universal	Purdue	Simplex	Bray	La Motte
Cecil Sandy Clay Loam Soil							
0	492	86	80	80	60	60	80
6	593	110	80	80	80	80	80
12	696	110	80	80	80	80	80
24	797	133	80	100	100	80	80
Orangeburg Fine Sandy Loam Soil							
0	844	24	10	10	10	10	10
10	1,827	24	10	10	10	10	10
30	1,913	55	20	20	20	20	20
50	2,254	70	20	20	20	20	20
80	2,518	94	20	20	20	20	20

Nitrogen and phosphoric acid constant.

Courtesy of Pee-Dee (S. C.) Exp. Sta.

The effect of potash on cotton on Orangeburg fine sandy loam. The plat at the right which received 20 lb. of potash per acre gave 1,683 lb. of seed cotton, while the plat at the left which received 80 lb. of potash produced 2,518 lb. of seed cotton per acre.

either a high or a low amount of this element.

These studies show that at least some of the rapid test methods are well adapted to South Carolina conditions for determining available phosphorus and potash. A correlation between quick test determinations and crop response indicates that quick test methods may prove very valuable in obtaining information on soils that will assist the agronomist in making suitable fertilizer recommendations for various soils for different crops.

Potash is Nature's Plant Vitamine

(*From page* 22)

Heretofore, Mr. Ossege had purchased 2-12-6 and 0-10-10 for his tomato crops. When he discussed fertilizer with us this past spring, and we recommended the 2-20-20, which cost him nearly $60 per ton, and at 500 pounds per acre nearly $15 per acre, he was inclined to believe we were trying to sell him more fertilizer than he needed. We were convinced, however, after a study of his farm history and his soil analysis, that the only way he could secure a reasonably good tomato crop was by applying large amounts of potash and phosphate with some nitrogen.

We applied 100 pounds each of phosphate and potash, and only 10 pounds of nitrogen. More nitrogen might have been used, but we felt that potash and phosphoric acid were the limiting factors to be considered first.

Mr. Ossege estimates his actual yield to have been 18 tons per acre, as he found it impossible to sell and use all the crop, not having time to salvage all of the fruit. These plants never did attain the size of plants we observed on other and better-maintained fields, but fruit could be picked three times each week, and it was most perfect in size, color, and quality.

We had many fields to observe and to compare with Mr. Ossege's field.

We had yields as high as 22 tons per acre and as low as 4 tons, but in every instance a heavy application of potash seemed to guarantee a better crop.

A recent issue of American Fertilizer and the December issue of New Agriculture carried our report of a yield of championship quality tomatoes grown by Claude Heintz of Hardin County, Ohio. The yield was not so high, but the quality was such that the St. Marys Packing Company of St. Marys, Ohio, canned Heintz's tomatoes separately, because he had fruit of superb quality. In planning on a tomato crop, we strongly recommend the use of at least 100 pounds of K_2O per acre, and, if a soil analysis shows less than 50 pounds of available P_2O_5 per acre, we believe 100 pounds of this element should be applied.

The writer addressed a tomato growers' convention Jan. 12, 1939, at Bowling Green, Ohio, where he heard growers express the desire for an 8- to 10-ton crop. We believe that a generous application of potash and phosphate, with nitrogen when needed, will assure a higher average. Our experience on both tomatoes and sugar beets is such that we want to sell no less than 20 units of K_2O per ton of mixed fertilizers for most of our soils.

Farm Records Show What Practices Pay

(*From page* 17)

(7) PROVIDE PRODUCTIVE WORK FOR ALL AVAILABLE LABOR THROUGHOUT THE YEAR. Labor is usually the largest single item of expense on Southern farms, frequently amounting to 40 per cent or more of the total expenses. Thus it's good business to keep labor busy at productive work, especially hired labor. Productive work means producing something to sell or to feed to livestock to be sold. The same principle holds true for workstock as well as men. It costs between $50 and $75 to properly keep a work animal for a year, and unless you get around 150 days work out of it you pay rather dear wages.

(8) USE ADEQUATE CROP ROTATION FOR FERTILITY MAINTENANCE AND EROSION CONTROL. Experiments show that where corn followed corn with no cover crop, an average of 48.6 tons of soil was lost per acre through erosion, while on similar soil under a 3-year rotation of corn followed by wheat and clover and timothy for 2 years, only 3.74 tons were lost. Winter cover crops on row-crop land are particularly important in soil protection and fertility maintenance. At the Tennessee Station, corn after corn yielded 30.8 bushels per acre. On similar soil where crimson clover was planted after the corn in the fall and turned under for the crop next spring, the yield was 43.4 bushels. Cotton following land in winter fallow made 416 pounds of lint, but where crimson clover was turned under made 530 pounds lint.

(9) IMPROVE CARRYING CAPACITY OF PASTURES. Pastures are our cheapest livestock feed. Adequate fertilization and judicious grazing have the most pronounced effect on thickening pasture sods. Unpublished data obtained from farmers in Tennessee indicate that most lands show a response to applications of lime and phosphates and, in many instances, potash on pasture legumes and grasses. Many pastures are grazed too closely and erosion and stunted herbage result. A carefully planned pasture program taking advantage of winter cover crops and supplemental pasture in mid-summer would do much to alleviate this condition. The cost of butterfat per pound from a group of cows on the

West Tennessee Experiment Station receiving only hay and pasture was 16.82 cents, while for a similar group receiving grain in addition, the cost was 18.25 cents. Over a 5-year period it was possible to have an average of 340 days of pasturing out of each 375.

(10) REDUCE CASH COST WITH HOME-GROWN FEEDS AND SEEDS. Home-grown feeds and seeds are practically always the cheapest because they require no freight or handling charges, and the farmer gets the benefit of the dealer's profit. Of course, certain purchased protein supplements are a necessity because they cannot be produced on the farm. Starting out with pure seed, it is often possible for farmers both to save money and insure improved stands by using seed of their own saving. In this way, they can be protected from adulterated and immature seed and be sure varieties are adapted to local conditions. Records show that Tennessee farmers are annually spending 50 per cent more on seed than on fertilizer. By far the greater part of this expense is for grass and clover seeds, when the primary cause for failure of these crops is the lack of sufficient plant food in the soil to establish vigorous sods.

Master Bill Barron Wins Potato Honors

(*From page* 14)

toes were clean and smooth when we dug them October 14 and graded 70% No. 1 Certified Seed, 5% seconds, and 25% table stock. They will be sold through the Cadillac Exchange with my father's crop."

Bill is a son of Frank Barron of Gladstone, Michigan, President of the Upper Peninsula Potato Growers' Association and widely known grower of Certified Russet Rural seed potatoes. He is an outstanding agricultural student, is keenly interested in potatoes, and plans to go into the Certified Seed Potato business with his father after he graduates next spring.

Sweepstakes Fruit Does Not "Happen"

(*From page* 10)

of a caterpillar tractor, and a large 8-barrel tank from which he runs one line of hose with a 6-nozzle broom, which operates under 600 pounds pressure.

"Spraying is costly, but profitable," he says. "Fertilizing apple trees not only increases the yield and improves the quality of fruit, but it gives to the trees strength to withstand the severities of winter and early spring."

His fruit is usually high-prize winner by reason of quality and color. He is a firm believer in plenty of potash to obtain high color. His results from using heavy applications of wood ashes and high potash mixtures seem to support him in his contention.

An outline of Mr. Hamilton's orcharding methods would be incomplete without some references to the prizes he has won. Here are a few:

1. First Prize at Imperial Fruit Show, London, England, 1921.

2. Sweepstakes at New York Fruit Show, several times.

3. Sweepstakes for Boxed Apples at The Royal Winter Fair, Toronto, many times.

All who know W. L. Hamilton recognize that he is a keen student of orcharding, a successful orchardist, and a real example of Canadian farmer gentleman.

Farmers' Week

(*From page* 5)

wise, it was a haven for the outspoken, rugged individualist whose right to dispute there was none to deny. It was here that the pioneer cooperatives fought their first rounds with the isolationists and nonconformists. Alas, they have also vanished with the checkerboard and the open cracker-barrel, leaving us in a void of "acceptable standards."

But nowadays you seldom see a bona fide dirt farmer arising in calm dignity and a frayed shirt to challenge the principles laid down at the Farmers' Weeks. The programs are too full—there just isn't time for any amateurs. I won't stop here to hunt for anything that's missing, though, for I am not quite sure that we have lost it. So much depends on your point of view.

WITH modern modes of travel and more high-school agriculture being taught, the day of the little one-room short course is probably gone forever. County agents and conservation committees have replaced the doughty institute conductors, but nothing can entirely take away man's zest for occasional garrulous gatherings. This urge the radio cannot supplant. Hence the trend has been away from localized seances and toward a greater emphasis upon big, spectacular, combined, all-inclusive panoramas. Given plenty of amplifiers and convenient parking space for autos, a home-State-products banquet or two, and a few imported authorities to shed rhetorical radiance, and we have the makings of a popular Farmers' Week à la 1939. Think not that I am critical. I am always for keeping agriculture stream-lined and comfortable in a changing world.

It has to be this way. Your modern farmer is a commercial being, gone beyond the meager self-sufficiency of his elders. The farms are not "remote" any longer—they're merely wards of some adjacent city in a sense, and kindred to the complexity thereof. If farm folks don't conform, they are apt to be confounded. Dentists and bankers and brick-layers and plumbers meet to hear the latest of their arts and crafts under rigid scientific and business control. The farmer too is rapidly moving in the same direction, and it explains why the best of them are willing to pay hotel bills awhile to attend a Farmers' Week, if lucky enough to have a good chore boy at home.

I dare say not one farmer in five hundred gets down to our own Farmers' Week program. By average rules of guessing, you would say that not much "extending" is being accomplished at that rate. This might be true were it not for three pertinent facts: First, the extension folks make many other contacts during the year besides; second, the station issues many circulars, bulletins, posters, news stories, and radio chats which reach far afield; third, every farmer who laps at the Pierian Spring during Farmers' Week is multiplied many times when he demonstrates those systems on his farm thereafter. I have met more farmers who got their best licks in farm improvement through experiment station trials via extension avenues, but who would not acknowledge it, than I have seen those who praised the source of their inspiration. In other words, every good farmer is an extension man whether he knows it or not.

But our latter-day Farmers' Week is far more than a technical laboratory sugar-plummed to be inviting. These weeks are occasions for new and stronger alliances, more thorough acquaintances with leaders and movements, and opportunities for studying State and national laws and policies which affect the portent of the times.

History shows full well that in each era the rate of progress and achievement depends largely on a relatively few open minds. Much as we claim to deny individualistic enterprise or decry its value

now, we cannot help believing that personal training and initiative still remain the strongest living forces to lead us onward.

Hence as I see it, the Farmers' Weeks are not so praiseworthy for mere educational uplift as they are in assembling so many wide open minds and resolute performers. They renew our courage and gird our faith. Like begets like. Men of similar bent find others of their ilk, or they meet odd ones with just enough challenging difference in viewpoint and objective to stir the imagination and whet the appetite for further trial.

Personal contact does wonders. You can't shake hands with the broadcasters or argue back with the farm paper editor. But you can do both during Farmers' Week and feel much better.

In recent years our Farmers' Week programs have developed some of the old social treasures which became neglected and forgotten in times of professional entertainment. Dial flippers and movie fans habituated us to canned music and syndicated humor, until we woke up to find that plenty of rural communities had germs of hidden talent to bestow. So now our rural drama and song festivals, our 4-H bands and "family" orchestras, with scene painters and costume designers to boot, furnish lively competitive events both at home and during the short courses.

Another contribution to the dignity of agriculture at some of these midwinter gatherings consists in giving public recognition of some kind to men and women whose humble but helpful lives have been dedicated to genuine country brotherhood. This is all to the good in an age when we see the artificial and commercial side of rural existence played up as the sole incentive for leadership. Whether we give these people engraved and hand-embellished scrolls of parchment or Master Farmer watch fobs, it makes little difference. At least we are feebly aiming at an ideal which is above mundane money grubbing. It is a custom which points an unerring finger to the fact that farming is a mode of life and living as well as a means of sustenance.

On the whole I believe we have a rich inheritance here in these fine Farmers' Week events, now so much a part of the rural year in nearly every State. We must not forget that the women come along, too, laying aside the cares and vexatious details of the farm larder and laundry for a brief respite eating somebody else's cooking and scanning somebody else's stitches. I have seen a few brave farmers sneak away to the capital town for these programs minus their helpmeets, but I did not envy their homecoming over much.

AND then when it's all over down to the last horse-hitch demonstration, and you reach home and get to pondering, how satisfactory it is to recall the folks you met and the sentiments you heard about agriculture; and when you turn on the radio during "farm hour" at noon-time, maybe you hear some fellow blasting away at bee-keeping or barley culture, and you say, "Maw, isn't this the smart cuss we heard last February?" Yes, it's sort of folksy and comforting to feel joined up all hands-round in a circle of hopeful and plodding producers—nothing flashy or gaudy, you know, but a kind of powerful inner force that sweeps us together for better times and finer things.

If there is any suggestion this scribe might offer to improve the underlying values of Farmers' Weeks it would be this: That some arrangements be made as soon as possible for an exchange fund from extension money to be expended gradually and with judgment in sending good speakers from the South to the North, and from our snow banks down into Dixie too. I think we miss a heap of true Americanism and unity by neglecting an exchange of authorities that way. Who will take my hunch up with the proper "finance committee" and get something done about it?

So now we will sign off until March and trust that the real message of Farmers' Week may carry us on through the whole Farmers' Year.

COURTLY CONVERSATION

In a kindergarten class the teacher was having them play king and queen, court bowing, etc. Little Isadore had been chosen as king and was quietly sitting by the little girl queen.

"Isadore," said the teacher, "you should talk to the queen and not just sit there."

Whereupon Isadore turned to the queen and said: "Good morning, queen, how's business?"

A man was buying some groceries when a second man entered, obviously in a great hurry. Throwing down a $1 bill on the counter he interrupted the other man's order.

"Give me some dog food," he said, and added to the other customer: "Hope you don't mind."

"Not if you're hungry," answered the other.

"I wanna come in."

"No, you tan't tum in."

"Why can't I?"

"Because Mama says boys shouldn't see litta gurls in nitedowns."

Short silence. "You tin tum in now; I took it off."

A buxom young Negress, in a very short dress, came before a municipal judge. His honor, having noticed her scanty clothing, suggested she go home and put on some clothes.

"Judge, Ah spects Ah kin dress like Ah wants."

"You are fined $5 for contempt of court."

Going to the clerk to pay the fine he inquired what it was for.

"The judge says Ah has to pay $5 fo 'temptin' de co't."

At the wedding reception the young man remarked: "Wasn't it annoying the way that baby cried during the whole ceremony?"

"It was simply dreadful," replied the prim little maid of honor. "When I get married I'm going to have printed right in the corner of the invitations: "No babies expected."

"Oh, mamma, look!" cried the little girl on her visit to the country. "There's a duck! And it walks like it had just got out of a rumble seat!"

CAGEY CALCULATION

The teacher was giving the youngsters a mental drill. "Now, Bobby, tell me which month has twenty-eight days in it."

Bobby had forgotten. After a moment he had the answer, "They all have."

He (kissing her gently): "Haven't I met you before, somewhere?"

She (kissing her gent): "No, it's just the situation that's so familiar."

A Negro preacher was interrupted by two dogs fighting on the church porch.

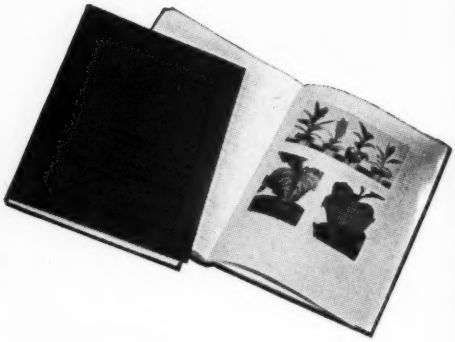
"Brothahs an' sistahs," he said, decisively, "Ah can see yo' attention has strayed from this Book, so Ah closes it; but Ah open this one, an' right now Ah lays five to four on the black dawg."

Boy: "Aunt Mabel's caught in the fence!"

His sister: "Goodness! What are you looking for, a crowbar?"

Boy: "No, my camera."

POTASH DEFICIENCY SYMPTOMS



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